

ROBO 1500 OPERATIONS GUIDE

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ROBO 1500 OPERATIONS GUIDE

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PREFACE

This manual explains how to install and operate the ROBO 1500 Computer Aided Drafting System. The manual assumes that you have set up your Apple II computer and disk drives and have some basic familiarity with the terms used.

How this manual is organised

CHAPTER 1	INTRODUCTION	Presents an overview of the system; Describes minimum equipment needed and discusses optional equipment.
CHAPTER 2	INSTALLATION	Provides instructions for the installation of all standard and optional equipment.
CHAPTER 3	OPERATION	Describes the main aspects of the system and how to operate it.
CHAPTER 4	FUNCTIONS	Presents full instructions on the use of all system functions.
APPENDIX A	THE LIBRARY	Explains how the Library system works, how you should organise your library, and how to format the disks.
APPENDIX B	ERRORS	Lists error conditions and how to recover from them.

How to use this manual

Read Chapter 1 first to familiarise yourself with the overall function and capabilities of the system.

Read Chapter 2 when you are ready to set up the system.

Read Chapter 3 when you get the system going for the first time.

Chapter 4 describes the use of all the system functions and can be used both as an introduction to the use of the system and subsequently as a reference source.

If you encounter an error when using the system, refer to Appendix B, which tells you how to recover from it.

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CHAPTER 1 INTRODUCTION

This chapter introduces the ROBO 1500 System; it explains what equipment is needed and what extra equipment can be added to get the most out of the system.

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1.1. THE ROBO 1500 SYSTEM

What it is

The ROBO 1500 System is a powerful and sophisticated Computer Aided Drafting package which can be installed in any Apple IIplus or Apple IIe computer.

The package is composed of a Controller unit with Interface module, a 'RoboRAM' card (128K), the System Master software, an Introductory Library disk, a further special Template Library disk, and this manual.

The Controller unit, a custom-designed joystick, serves as the drawing instrument and also gives commands to the system. Minimal use is made of the computer keyboard, except for the use of text in drawings and for the specification of precision numeric data.

The system is easy to learn and easy to use, and requires very little computer knowledge. Nevertheless, the experienced designer or draftsman will find a powerful and flexible set of facilities when using this system.

What it does

The ROBO 1500 System can be used for the production, storage and maintenance of a large range of drafting and other graphical material for the following typical applications -

- * Architecture
- * Building
- * Civil Engineering
- * Mechanical
- * Panel work
- * Packaging

In addition, this system is well suited to the following applications covered by other products in the ROBO range -

- | | |
|---------------|-----------------|
| * Electrical | * Presentations |
| * Chemical | * Plan Charts |
| * Fluid Power | * Forms & Pages |
| * Planning | * Illustration |
| * Layouts | * View Foils |
| * P.C.B. | * Slides |

1.2. MINIMUM SYSTEM

The minimum equipment required to operate the system comprises two elements, the HOST COMPUTER and the ROBO 1500 package.

Host Computer

APPLE IIe Computer, or APPLE IIplus Computer upgraded to 64K RAM
APPLE Disk Drives (2), DOS 3.3, including Disk Controller Card
MONITOR Monochrome or Colour

ROBO 1500 Package

Custom 3-axis Controller with Interface module
RoboRAM Card (128K)
System Master Disk (2 copies)
Intro Library Disk and Template Library Disk
User Manual

1.3. FULL SYSTEM

The minimum system described above can be extended with the addition of the following components:

Plotter and/or Printer
Digitizer Tablet
'Accelerator'

Video Display options are also reviewed below.

Plotters

Essential for high quality finished artwork, plotters come in a variety of shapes and sizes. Main distinguishing features are price, paper size, plotting speed, accuracy, line quality, number and type of pens.

Plotter driver software is available for many drafting plotters and is supplied as a separate software product. This software provides many advanced features including scaling, control of colour, line weight and line style, and the ability to select any detail of the drawing and position it anywhere within the plot area.

Printers

Useful for quick proofing of artwork, many printers operate with this system. No additional software is required, but the printer interface card must include a 'Graphics Dump' facility.

Digitizing Tablets

The system supports the use of a digitizing tablet as an alternative form of input, allowing you to enter existing artwork. No additional software is required.

'Accelerator'

These cards significantly improve the performance of the system. For professional use, particularly where complex tasks are to be performed, the use of one of these cards is highly recommended.

FULL SYSTEM (Cont.)

Video Displays

There is a wide range of video displays available which can be used with the system.

For professional use, important features are stability of the display, low distortion and (if not monochrome) colour quality. For prolonged use, Video Monitors are always preferable to TV receivers, and are therefore recommended.

Listed below are the main types of display, starting with the least expensive:

- i. Monochrome TV Receiver, using an RF modulator.
- ii. Monochrome Video Monitor. Better than (iii) for technical line work, unless colour essential.
- iii. Colour TV Receiver. A PAL Colour card is required if using the Apple IIplus (not IIe).
- iv. Composite Colour Video Monitor. A PAL Colour card is required if using the Apple IIplus (not IIe).
- v. RGB Colour Video Monitor. Requires an RGB Interface card.
- vi. Video Projectors; available in several formats.

CHAPTER 2 INSTALLATION

To install the various components of the system, and to perform essential trimming and configuring, follow the instructions presented in this chapter.

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2.1. CONTROLLER INSTALLATION

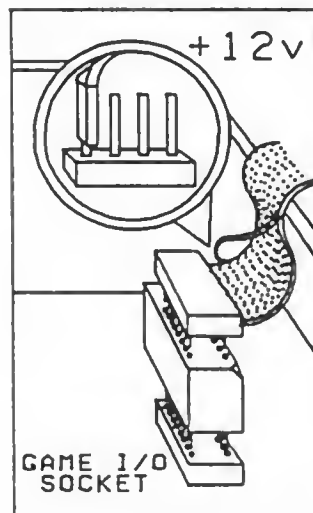
This requires no technical knowledge, but it does need care.

- 1 Make sure that the computer is switched off.
- 2 Remove the top cover of the computer.
- 3 The Controller lead is fitted with a special connector - the 'Interface Module'.

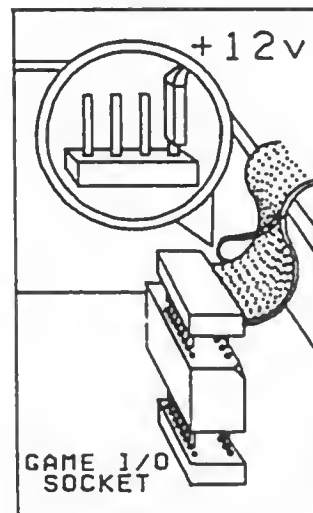
Insert the Interface Module in the 16-pin (games) socket at the right rear corner of the computer's main circuit board. Before insertion, check that the pins are straight and aligned with the socket. When inserting, ensure that the triangular marker on the Interface Module points towards the front of the computer.

- 4 The Controller lead also includes a single wire breakout.

Identify the 4-pin auxiliary video connector beside the games socket, and insert the single wire on the pin illustrated below. Note that the pin position depends on the version of the computer being used.



APPLE II +



APPLE II e

2.2. CARD INSTALLATION

The APPLE Disk Drives, and other peripheral equipment used with the computer, require controller or interface cards to be installed on the main circuit board. Additionally, the ROBO 1500 System requires a total of 192K RAM, which is provided by the installation of memory expansion cards.

Before you start, make sure that the computer is switched off. Also ensure that you have read the manufacturer's instructions fully.

All cards are inserted such that the components face right, when viewed from the front of the computer.

The card arrangement set out below for both essential and optional cards is as recommended, but if it conflicts with your preferred layout, you can tell the system what is where by performing 'CONFIGURE SYSTEM', described in Section 2.6.

Cards : Essential

Slot	Card
* 0	16K RAM Board / 'Language Card'
3	RoboRAM Board (128K)
6	Disk Controller Card

* Required for APPLE IIplus only. Slot 0 is at the left when viewed from the front of the computer.

Cards : Optional

Slot	Card
1	Printer interface (with 'Graphics Dump')
* 2	Plotter interface (RS232 Serial)
4	Digitiser interface
5	'Accelerator'
7	R.G.B. Video interface

* Full instructions on the installation of drafting plotters are provided with the Plotter Software, available seperately.

2.3. DISKS

The SYSTEM MASTER

2 Copies of the SYSTEM MASTER, containing the system software, are supplied. One copy is intended for immediate use and the other is a back-up copy, which should be stored in a clean, dry environment clear of strong magnetic fields and other hazards.

The INTRD Library Disk and TEMPLATE Library Disk

Also included in the package is 1 Copy of the INTRO Library Disk, which contains a variety of pre-drawn material, and 1 copy of a TEMPLATE Library Disk, containing further pre-drawn material.

Since the sample Library Disks, unlike the System Master, are copyable, you should make back-up copies of them before using the system. See 'Disk Back-up' below.

LIBRARY Disks

Library Disks are used to store all the drawings and graphics which you create when using the system. The included sample Library Disks are themselves normal Library disks.

There are three types of Library Disk, designated by Volume Number -

VOL 1 - 12	Compiler	- for interim assembly of drawings
VOL 13 - 253	Source	- for permanent storage of symbols, components and 'modules'
VOL 254	Archive	- for permanent storage of finished work

You can establish up to 63 different SETS of Library Volumes 1 - 254.

Library Disks, and their formatting, are described fully in Appendix A - 'The Library'.

Disk Back-up

To copy a disk, follow the instructions given in the 'DOS User's Manual' provided with the Disk Drives.

Because considerable effort can go into generating drawings, and because your time is valuable, get into the habit of producing regular back-ups of your Library Disks.

2.3. DISKS (Cont.)

Which Drives ?

SYSTEM MASTER : in DRIVE 1 - throughout the session

LIBRARY DISKS : in DRIVE 2 - can be changed during a session

Handling Disks

Floppy disks can be easily damaged by improper handling - Please bear these points in mind :

- * Avoid touching the exposed surface of the disk
- * Do not remove a disk from a drive which is still running
- * Keep clear of magnetic surfaces (e.g. certain tablets and plotters)
- * Store carefully

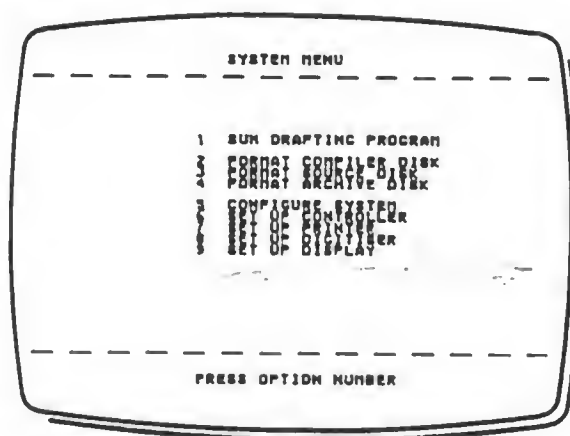
Media

The APPLE Disk Drives use standard 5 1/4 inch single-sided, single-density floppy disks. Although any compatible disk can be used, we recommend the use of good quality disks.

2.4. LOADING THE SOFTWARE

Having installed all the hardware components of the system, you can proceed to load the software.

- 1 Start with all the equipment switched off.
- 2 Switch on the video monitor.
- 3 Insert the System Master disk in Drive 1 , insert a Library disk in Drive 2 and close the disk drive flaps.
- 4 Switch on the APPLE Computer. The disk drive will run briefly and a Title Page is displayed. When loading is complete, the System Menu is presented :



- 5 Please read and continue from the next Section, 'Trimming the Controller', if this is the first time the system is being used.
- 6 Otherwise, in normal use, select Option 1, 'Run Drafting Program'.

If the wrong disk has been inserted in Drive 2, a message is displayed, requesting that you insert a Library Disk in Drive 2 and to press RETURN to proceed.

The 'Configure' and 'Set up' options (5 to 9) are described in the remainder of this chapter.

The 'Format' options (2 to 4) are dealt with in Appendix A.

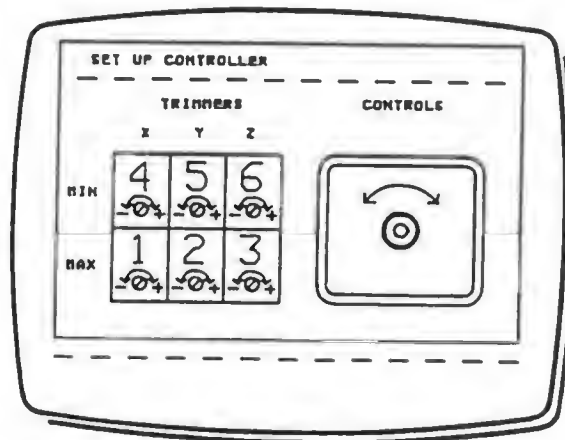
2.5. TRIMMING THE CONTROLLER

Although the Controller is accurately calibrated when manufactured, component values in the computer can vary slightly; this may cause anomalies in the readings from the three control axes.

These variations can be rectified very simply by adjusting the trimmers on the underside of the Controller. This is a one-time procedure which need not be repeated if the Controller remains connected to the same computer.

Adjust the trimmers in the sequence presented, using the small screwdriver provided.

- 1 Select Option 6 from the System Menu. Wait briefly while the Trimming diagram is displayed.



- 2 The diagram depicts, on the left, the trimmers as seen from the underside of the Controller, and on the right, the control axes viewed from above. The two lines of text at the bottom present the instructions, with key words displayed in reverse.
- 3 Follow the prompts to complete the sequence of six operations, pressing RETURN after each step.

CAUTION ° Make the adjustments in very small steps. The correct procedure is to achieve the 'OK' state as the axis control just reaches its limit of travel.

2.6. SYSTEM SET UP

In Section 2.2 we describe how to set up the hardware additions and options. Here we show how to tell the software which options are being used. It is important that the system is configured before you Run Drafting Program, otherwise the system will assume the default recommended layout specified in Section 2.2.

Although the procedures described below need only be performed once when initially setting up the system, the selections can be re-specified at any future time to accomodate any changes in your system configuration.

There are 4 relevant selections on the System Menu -

Option 5 : CONFIGURE SYSTEM
7 : SET UP PRINTER
8 : SET UP DIGITISER
9 : SET UP DISPLAY

Each of these procedures are described in detail below.

Configure System

- 1 Select Option 5 from the System Menu. The following screen is displayed :

```
CONFIGURE SYSTEM
-----
PRINTER INTERFACE      00
PLOTTER INTERFACE      0
ROBO-RAN CARD         3
DIGITIZER INTERFACE    0
ACCELERATOR            0
DISK CONTROLLER        6
VIDEO INTERFACE        0
-----
PRESS <ESC> TO RETURN TO MENU
ENTER SLOT NUMBER AND PRESS <RETURN>
```

2.6. SYSTEM SET UP (Cont.)

- 2 The screen displays the 'default' layout as described in Section 2.2.

If the default slot number for the Card is correct, just press RETURN and proceed to the next item.

Otherwise, enter the correct slot number for the card and press RETURN. Note that you cannot assign more than one card to a particular slot.

- 3 When you have specified all Cards, the System Master disk is set up for the configuration entered and the System Menu is re-displayed.

If you use ESC to return to the System Menu before you have specified all the slots, you must re-select this option and complete the full sequence before the system can be used.

Set up Printer

First ensure that the cable is properly connected between the Printer and the Printer Interface card, and that any special switch settings on the Interface card have been applied. Refer to the documentation supplied with your printer and/or printer interface if in doubt.

The set up operation described below simply tells the system which type of card is being used, so that the correct codes can be sent to perform 'graphics printing'.

- 1 Select Option 7 from the System Menu. A screen is presented listing the supported printer interfaces.

- 2 Press the option number for your printer interface.

Note that the last option ('User Defined') allows you to enter the Control Character String for other types of printer interface card. Consult the documentation provided with the interface card for the relevant codes.

- 3 Having made your selection, the System Menu is re-displayed

2.6. SYSTEM SET UP (Cont.)

Set up Tablet

- 1 Select Option 8 from the System Menu. A screen is presented listing the supported Digitising Tablets.
- 2 Press the option number for your selection.
- 3 Having made your selection, the System Menu is re-displayed

NOTE The 'Houston' Digitiser tablet will not operate if an 'Accelerator' card is installed.

Set up Display

Many types of Monitor and R.G.B. Video interface can be used with no special handling. However, certain types of display interface do need to be treated differently by the system. For these special cases, the interface type needs to be specified.

- 1 Select Option 9 from the System Menu. A screen is presented listing the special display interfaces.
- 2 Press the option number for your display interface.
- 3 Having made your selection, the System Menu is re-displayed

NOTE : If you subsequently revert to a 'normal' display interface, use 'Set up Display' to tell the system that a normal interface is now present.

Disk Protection

Having completed the installation of the hardware and the configuration of the system, be sure to apply a Write Protect Tag to the System Master disk. This will protect the disk against accidental over-writing.

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CHAPTER 3 OPERATION

This chapter introduces the main aspects of the system and the way in which it is operated.

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3.1. THE SCREEN

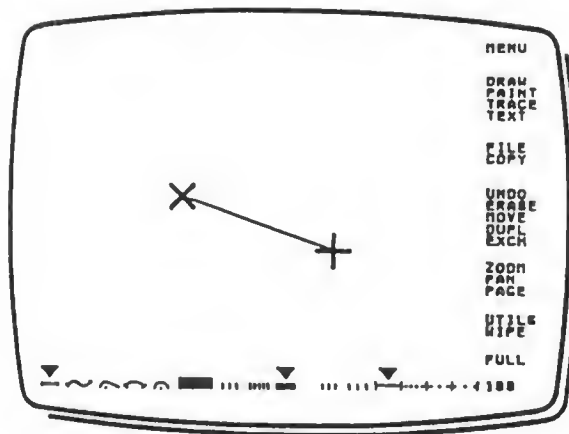
First load the software and 'Run Drafting Program'.

The procedure for loading the software is described fully in Section 2.4. In summary :

- 1 Start with the Apple computer switched off.
- 2 Insert the System Master disk in Drive 1.
 Insert a Library disk in Drive 2.
- 3 Switch on the Apple computer. The Title Page is displayed followed by the System Menu.
- 4 Select Option 1 - Run Drafting Program.

When the program has been loaded, a screen is displayed with a block of labels down the right hand side (the 'Menu') and various symbols along the bottom (the 'Palette').

This screen is your working environment - all drawing is performed on the blank area (the 'Work Page'), and you select different commands and operations from the Menu and Palette.



3.2. USING THE CONTROLLER

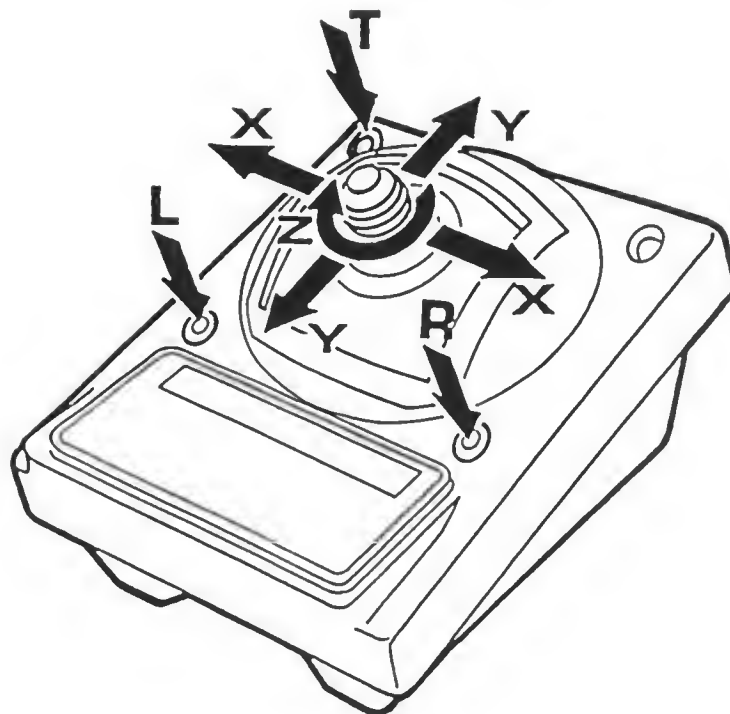
The Controller is designed to be used as an extension from the computer console, so that you can make yourself comfortable and concentrate on the screen. Try to operate the controls by touch, keeping your eyes on the screen, and you will soon be using the controller as naturally as a pencil.

Controller Commands

The controller is used both as a drawing instrument and as the means of giving commands to the system and selecting options.

In general, the controls function as follows :

- The stick ('XY') - controls the position of the 'cursor' by up/down, left/right or diagonal movement.
- The knob ('Z') - controls variable values, e.g. size, rotation, etc.
- Left Button ('L') - selects a menu command
- Right Button ('R') - releases the 'cursor' from the work page
- Top Button ('T') - executes a command
- Left & Right ('L+R') - exits a menu command
- Left & Top ('L+T') - selects and performs the UNDO and WIPE commands



3.2. USING THE CONTROLLER (Cont.)

Command Abbreviations

The following abbreviations for Controller operations are used throughout the remainder this manual :

- ROTATE Z - Rotate control knob
- L - Left button
- R - Right button
- T - Top button
- L + R - Left & Right buttons simultaneously
- L + T - Left & Top buttons simultaneously

Controller Operation

Use one hand for 'stick' and 'knob' movements, and the other for all button presses.

The buttons are usually operated by a press and release action, although sometimes you will have to press and hold a button.

When a press and release action is used, the system accepts the instruction only when the button is released.

Cursors

On the Work Page is an 'x' and a '+' connected by a line. These are 'Cursors', and they can be moved around the screen with the Controller joystick.

The 'x' cursor is termed the Origin cursor ; it is static and defines the start point when drawing.

The '+' cursor is termed the Dynamic cursor ; it is active and defines the end point when drawing. It is also used to make selections from the Menu and Palette.

The line that connects these two cursors is 'rubber-banded' - which means that it stretches and contracts as you move the Dynamic cursor.

3.2. USING THE CONTROLLER (Cont.)

How to 'update' the Cursor

To establish a start point when drawing, position the dynamic cursor at the required point, and Press L to update the origin cursor to this point.

How to 'free' the Cursor from the Work Page

To make selections with the Cursor from the 'Menu' or 'Palette', press and hold R, and release R when the selection is made.

Menus

Functions are selected, and commands are given to the system, by using the cursor movement to pick a function from the menu.

There are two Menus - Menu 1 and Menu 2 :

MENU	
DRAW	
PAINT	
TRACE	
TEXT	
FILE	
COPY	
UNDO	
ERASE	
MOVE	
DUPL	
EXCH	
ZOOM	
PAN	
PAGE	
UTILS	
WIPE	
FULL	
100	

MENU	
ANGLE	
-0	
0	
0	
90	
0	
0	
ORTH	
N-TAN	
GRID1	
GRID11	
X 4	
Y 4	
FIND	
POINT	
SCALE	
DIMN	
FULL	
100	

3.2. USING THE CONTROLLER (Cont.)

Selecting a function from the Menu

- 1 Press and hold R and move the cursor to the 'MENU' legend at the top right corner of the screen.

A flashing white box appears around the 'MENU' legend.
Release R.
- 2 Press and release L to confirm the selection; another Menu is displayed (Menu 2).
- 3 Move the cursor to the left, away from 'MENU', to return to the work page.
- 4 Press and hold R and move the cursor to 'MENU'; release R; press and release L - Menu 1 is returned.
- 5 Move the cursor to the left to return the to the Work Page.
Note that the 'DRAW' function is automatically selected, being the 'default' function.

The procedure for selecting any Menu function is just as described in steps 1 - 3 above, but for the moment do not try making selections from either menu.

Memory Counter

The number displayed at the bottom of the Menu is the Memory counter. It shows the percentage of memory remaining for drawing. When the percentage falls below 1%, you should FILE the drawing (See Section 4.2.1.).

Other selections can be made from the palette in a similar way. Note that you don't have to Press L to make a selection from the palette, unlike the menu.

3.3. USING THE FUNCTIONS

System Functions

The system Functions are presented on the two menus, Menu 1 and Menu 2. They are grouped on the menus according to their overall uses, as follows -

Menu 1 :	'Create'	'Library'	'Edit'	'View'	'Utilities'
	DRAW	FILE	UNDO	ZOOM	UTILS
	PAINT	COPY	ERASE	PAN	WIPE
	TRACE		MOVE	PAGE	FULL
	TEXT		DUPL		
			EXCH		

Menu 2 :	'Angles'	'Grids'	'Locate'	'Numeric Control'
	ANGLE	GRID I	FINO	SCALE
	ORTH	GRID II	POINT	DIMN
	N-TAN			

The Menus can be changed by selecting 'MENU' at the top right of the screen.

Drawing Methods

Drawings can be produced in three overall ways -

- 'FREE-FORM' - Just drawing on the screen as if on paper with no construction aids such as 'ruler', 'compass' or 'protractor'.

Sections 4.1. to 4.5. describe how to use the main functions of the system in free-form mode.

- 'PRECISION' - As 'Free-form', but using GRID, ANGLE and POINT Locks, which provide aids to drawing construction.

Sections 4.6. to 4.8. describe the use of the precision functions, which can be used in conjunction with the main functions.

- 'SCALED' - As 'Precision', but enabling all components of the drawing to be defined numerically by using the SCALE and DIMN functions.

Section 4.9. describes the use of the SCALE function, which enables the main and precision functions to be used in Scale Mode.

3.3. USING THE FUNCTIONS (Cont.)

Function Summary

'Create'

DRAW, PAINT, TRACE, and TEXT - provide all the facilities necessary to generate new drawings and graphics.

'Library'

FILE and COPY - enable you to store drawings and graphics on Library disks (via FILE) and to use stored drawings as modules in other drawings (via COPY).

'Edit'

UNDO, ERASE, MOVE, DUPL ('DUPLICATE') and EXCH ('EXCHANGE') - provide the means for making corrections and amendments during drawing and for subsequent alterations.

'View'

ZOOM, PAN and PAGE - provide different ways of viewing a drawing. PAGE regenerates the drawing at its 'base scale'; ZOOM allows you to select a part of the drawing and 'zoom in' (ie magnify it) - and also 'zoom out' from a magnified view; PAN lets you move around a zoomed (magnified) view.

'Utilities'

UTILS, WIPE and FULL - provide a set of general system utilities.

'Angles'

ANGLE, ORTH ('ORTHOGONAL') and N-TAN ('NORMAL-TANGENT') - enable you to restrict cursor movement along defined angle paths, thereby entering the components of a drawing in precise angular relationships.

'Grids'

GRID I and GRID II - provide further constructional aids by constraining cursor movement to defined Grid points.

3.3. USING THE FUNCTIONS (Cont.)

'Locate'

FIND and POINT - provide ways of locating and locking data end points to assist in drawing construction.

'Numeric Control'

SCALE and DIMN ('DIMension') - allow you to use the system in a full scalar mode, defining all items of the drawing numerically, and subsequently to dimension those items.

CHAPTER 4 FUNCTIONS

This chapter describes all the system Functions and shows how they can be used to produce, edit and store your drawings.

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4.1.1. DRAW

- * Provides the basic drawing operations.

Operation

- 1 DRAW is the 'default' system function : it is automatically selected on loading the system and after a 'WIPE' (system reset). Otherwise select DRAW from Menu 1.
- 2 DRAW is used in conjunction with the DRAW PALETTE, which allows you to select the Draw mode and to set the Colour and Line Type. The Draw modes are as follows :

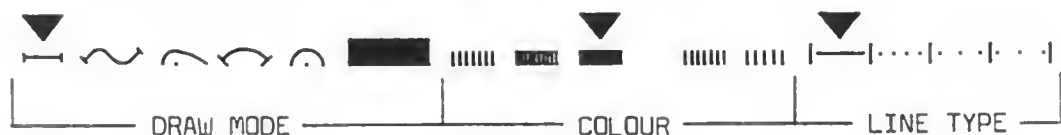
LINE and POINT
 TANGENT ARC
 RADIAL ARC
 COMPASS ARC
 CIRCLE
 NIB

The use of the different Draw modes is described in the following pages.

Escape

The default Draw mode is Line/Point; to change Draw mode, select another from the Palette.

To exit DRAW, select another function from Menu 1.





4.1.1. DRAW : LINE

- 1 Select LINE from the Palette, if not already selected.
- 2 Move the Dynamic cursor to the start of the line and update the Origin cursor to this position by pressing L.
- 3 Move the Dynamic cursor to the end of the required line - the 'rubber-band' indicates the resulting line.
- 4 Press T to draw the line. The line is drawn in the Colour and Line Type currently selected on the Draw Palette.
- 5 The Origin cursor automatically updates to the end of the drawn line.

To continue drawing from a new origin, move the Dynamic cursor again and press L to update the Origin cursor to the new start point.

SEE Section 4.9. For using LINE in SCALE drawing.



4.1.1. DRAW : POINT

- 1 Select LINE from the Palette, if not already selected.
- 2 Move the Dynamic cursor to the required point, and update the Origin cursor to this position by pressing L.
- 3 Press T to draw the point. The point is drawn in the Colour currently selected on the palette.

SEE Section 4.8.2. For full precision when drawing points, use the POINT lock.

4.1.1. DRAW : TANGENT ARC



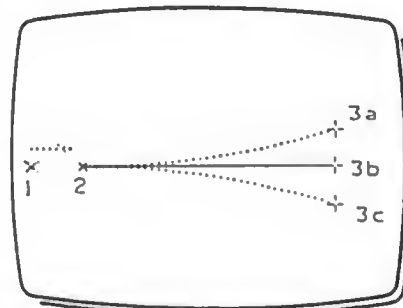
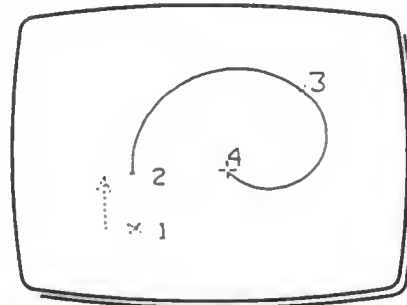
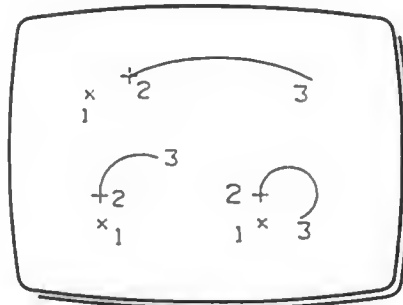
- 1 Select TAN ARC from the Palette.

The Line 'rubber-band' is replaced by an Arc rubber-band, blending from the previous end-point.

- 2 Set the arc by moving the Dynamic cursor to the required end point.
- 3 Press T to draw the arc. The arc is drawn in the Colour and Line Type currently selected on the palette.
- 4 The Origin cursor automatically updates to the end of the drawn arc. To continue the arc, move the Dynamic cursor to a new end point and press T to draw.
- 5 To start a new arc in 'free space' (ie not connected to a previous end point), move the Dynamic cursor to the new start point, press L to update the Origin cursor, then set and draw the arc as described in Steps 2 and 3.

If you need to establish a new direction for the arc, update the Origin cursor twice along the required path.

NOTE If the arc is almost flat, it will default to a straight line.



4.1.1. DRAW : RADIAL ARC



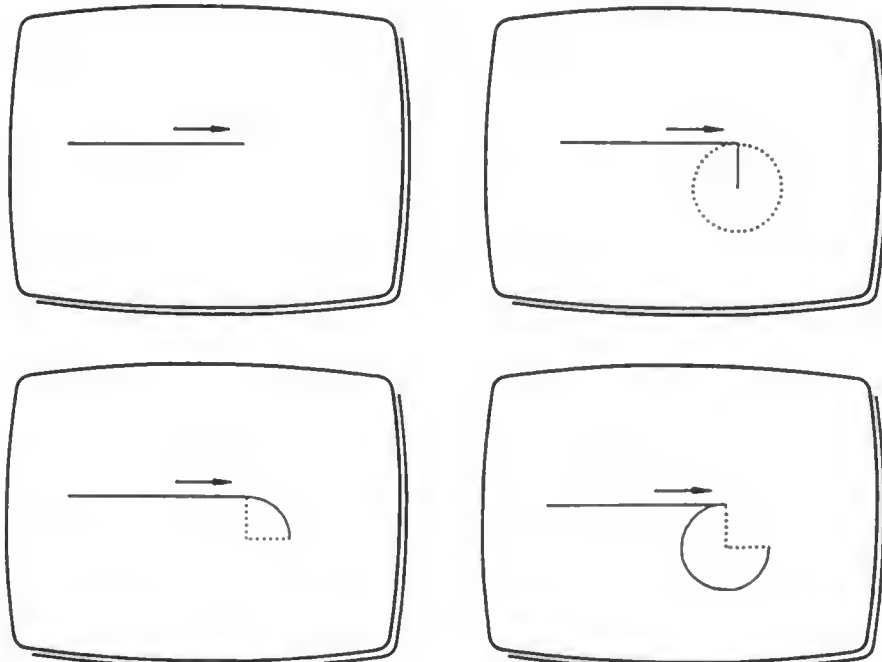
- 1 Select RAD ARC from the Palette.

The Origin and Dynamic cursors are replaced by a line and a dotted circle. The line, at right-angles to the last item entered, indicates the radius of the arc and the circle describes the resulting circular arc.

NOTE At this point, and at any step below, you can 'escape' from the Rad Arc mode by holding down R to activate the Dynamic cursor. This can be used to make another palette or menu selection.

- 2 Move the radius line until the required radius is established. Press L to set the radius.
- 3 Move around the defined centre to set the angle of the arc segment. You can press L to reverse the direction of the arc.
- 4 When the segment has been set, press T to draw the arc. The arc is drawn in the Colour and Line Type currently selected on the palette.
- 5 Another arc, blending from the previous, can be drawn; otherwise, 'escape' by holding down R as described in the Note above, to select another option.

SEE Section 4.9. For using RAD ARC in SCALE drawing.





4.1.1. DRAW : COMPASS ARC

- 1 Select COMP ARC from the Palette.

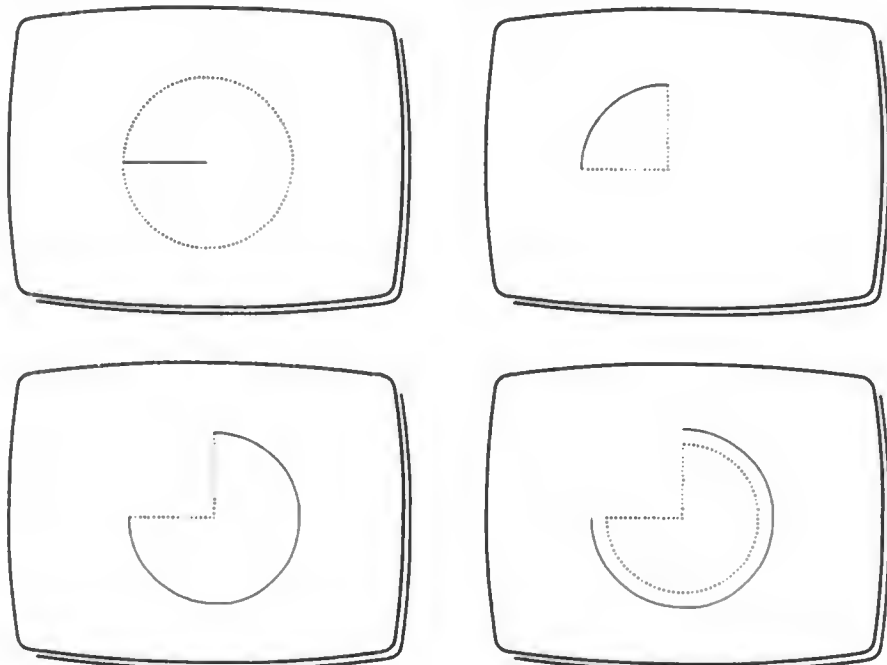
The Origin and Dynamic cursors are replaced by a line and a dotted circle. The line, emanating from the Origin cursor, indicates the radius of the arc, and the circle describes the resulting circular arc.

NOTE At this point, and at any step below, you can 'escape' from the Compass Arc mode by holding down R to activate the Dynamic cursor. This can be used to make another palette or menu selection.

- 2 Move around the origin of the radius line to establish the start position of the arc, and move the radius line until the required radius is established. Press L to set the radius.
- 3 Move around the defined centre to set the angle of the arc segment. You can press L to reverse the direction of the arc.
- 4 When the segment has been set, press T to draw the arc. The arc is drawn in the Colour and Line Type currently selected on the palette.
- 5 Another arc, sourced from the same centre, can be drawn; otherwise, 'escape' by holding down R as described in the Note above, to select another option.

NOTE If COMP ARC is used to draw complete circles, such circles will leave traces on the screen if erased. These traces disappear after using PAGE. Circles drawn with the Circle cursor will erase normally.

SEE Section 4.9. For using COMP ARC in SCALE drawing.





4.1.1. DRAW : CIRCLE



- 1 Select CIRCLE from the Palette.

The Dynamic cursor is replaced by the Circle cursor.

- 2 Move the centre of the Circle cursor to the required origin of the circle.

- 3 Rotate Z to adjust the diameter of the Circle cursor.

- 4 Press T to draw the circle defined by the cursor. The circle is drawn in the Colour and Line Type currently selected on the palette.

The drawn circle may not be visible until the cursor is moved away.

SEE Section 4.9. For using CIRCLE in SCALE drawing.

4.1.1. DRAW : NIB



- 1 Select NIB from the Palette.

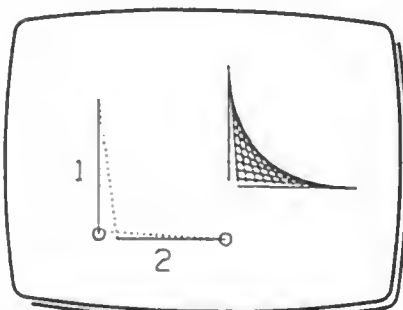
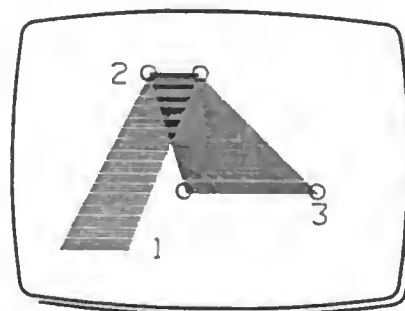
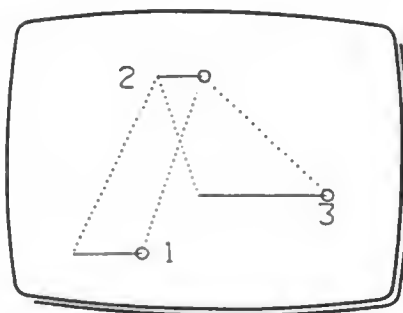
The Origin and Dynamic cursors are replaced by two Nib cursors. The Dynamic Nib is an extendable line with a small marker on one end, indicating the 'active' part of the cursor for menu and palette selection.

Drawing between the Origin Nib and the Dynamic Nib produces 'block' drawing between the two Nib cursors.

- 2 Adjust the Dynamic Nib width by rotating Z.
- 3 Adjust the Dynamic Nib angle by holding down R and rotating Z; release R when the required angle is set.
- 4 Position the Dynamic Nib at the requires start point and update the Origin Nib by pressing L - this establishes the start position, length and angle of the nib stroke.
- 5 Move the Dynamic Nib to the end point of the nib stroke, and adjust length (Rotate Z) and angle (Hold R, Rotate Z, Release R) if required.
- 6 Press T to draw the nib stroke (the area between the two nib cursors). The nib stroke is drawn in the Colour and Line Type currently selected on the palette.

NOTE By altering Line Type, the spacing across the width of the nib can be varied.

- 7 The spacing along the length of the nib (Nib Style) can be altered by moving the Dynamic Nib to the Nib Indicator on the palette, and holding down L. Rotate Z to vary the Nib Indicator from 'solid' (the default state) through to a maximum spacing of 5 points. Release L to set the Nib Style.



4.1.2. PAINT

- * Enables you to fill any completely enclosed area of a drawing with one of 16 colours.

PAINT is used in conjunction with the Paint Palette, which provides 16 colour choices. PAINT is 'screen- based' and cannot be reproduced on a pen plotter.

Operation

- 1 Select PAINT from Menu 1. The Paint Palette is displayed, replacing the palette previously in operation.
- 2 Select the required Colour from the Paint palette.
- 3 Position the cursor over the area to be painted.
- 4 Press T to fill the enclosed area with the Colour currently selected on the Paint Palette.

NOTE An attempt to fill any area not fully enclosed will cause a leak of colour through the gap. Beware of the following conditions :

ZOOM (See Section 4.4.1) - Areas might be opened up under Zoom.

UNDO & ERASE (See Section 4.3) - After use, gaps may be caused in parts of the drawing. Use PAGE (See Section 4.4.3) to regenerate the drawing intact.

GRIDS (See Section 4.7) - When switched off, gaps will be caused in parts of the drawing. Use PAGE.

Escape

Select another function from Menu 1 with the Paint cursor.



4.1.3. TRACE

- * Enables freehand drawing in 'Stream' mode. In this mode, a continuous freehand line is drawn following XY movement.

Operation

- 1 Select TRACE from Menu 1. A single dot cursor replaces the Origin and Dynamic cursors.
- 2 Position the cursor at the required start.
- 3 Hold down T and move the cursor along the required path. A continuous line is generated in the Colour currently selected on the Draw palette. Release T to stop drawing.

NOTE TRACE uses up a lot of memory and should be used sparingly. The system will beep when 1000 bytes of continuous line has been entered, and will stop accepting more. To continue, Release T and restart from the end point.

Escape

Select another function from Menu 1 with the Trace cursor.

4.1.4. TEXT

- * Enables you to incorporate text in drawings.

Operation

- 1 Select TEXT from Menu 1. The Text Entry Screen replaces the Work Page.
- 2 Enter the text from the keyboard, terminating each complete line with RETURN.
- 3 Upper Case (ie Capitals) is shown by 'inverse' display.

APPLE II plus

To switch from Upper Case to Lower Case, press ESC.
To revert to Upper Case, press ESC again.

APPLE IIe

Use the SHIFT key to alter between Upper and Lower Case.

- 4 You can edit the text block by using the following keys :

CTRL W	-	Cursor Up	or	↑	-	Up
CTRL Z	-	Cursor Down		↓	-	Down
CTRL A	-	Cursor Left		←	-	Left
CTRL S	-	Cursor Right		→	-	Right

CTRL I - Insert
CTRL D - Delete Character
CTRL X - Delete Line

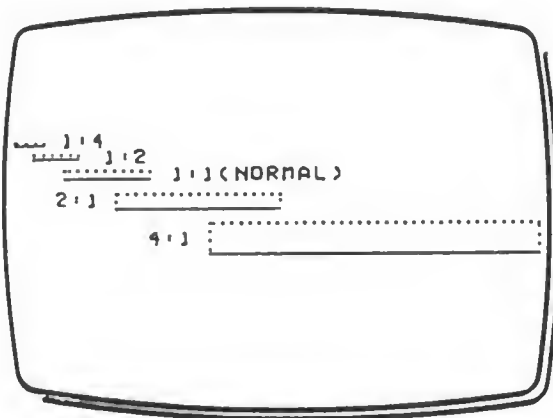
* (Apple IIe only)

- 5 When you have entered and formatted the line or block of text, press L & R to revert to the Work Page. The Text cursor, configured to the text entered, is displayed.
- 6 The solid line on the bottom of the Text cursor indicates the orientation of the text block, which can be rotated in steps of 90 deg (0,90,180,270), by pressing L.

4.2.4. TEXT (Cont.)

- 7 The size of the Text cursor can be adjusted, by rotating Z, through the following range :

Scale : 4, 2, 1, 1/2, 1/4



- 8 When the position, size and rotation of the Text cursor has been set, press T to draw the Text in the Colour currently selected on the Draw palette.

NOTE Text which is too small to be legible at any given scale is displayed as a dot pattern to indicate its presence.

Similarly, any text greater than 8 times base scale (via ZOOM) will not be displayed, although still held in memory.

NOTE In addition to the standard text characters, the system provides some additional characters for use in technical and architectural drawings. These Special Characters, together with the keys which generate them, are as follows

Keyboard	Text
@	£ - Pound sterling
CTRL C	° - Degrees
CTRL O	∅ - Diameter
CTRL T	± - Tolerance
CTRL V	< - Dimensioning arrow
CTRL 8	/ - Dimensioning marker

SEE Section 4.9. For the use of TEXT in SCALE drawing.

Escape

Press L & R together.

4.2.1. FILE

- * Stores the contents of the Work Page on a Library Disk.

Operation

- 1 Select FILE from Menu 1. The current (last used or default) Library Index is displayed with an active File cursor. The figure on the right side of the Index shows the percentage of space remaining on the disk.

If another Library Index is required, press R for the next index, or L for the previous one.



- 2 Position the cursor over a box.

An existing 'file' can be overwritten by a new drawing if it is no longer required, and is then permanently erased from the Library disk. If this is attempted, a prompt requests confirmation before proceeding.

- 3 Press T. The data is transferred to the Library disk, then an 'icon' of the drawing is generated in the box. If you want to suppress the generation of a file icon, press the keyboard SPACE BAR.
- 4 When filing is complete, the Text Entry Screen is displayed, allowing you to label the filed drawing.

The size of the label depends on the index format :

64-box index	-	12 characters (3 lines of 4 chars.)
16-box index	-	54 characters (6 lines of 9 chars.)
4-box index	-	216 characters (12 lines of 18 chars.)

The label overwrites the 'icon' of the drawing and does not form part of the data; it is for your reference use.

Escape

When you have entered the label, press L & R to apply the label and revert to the Work Page.

If you do not want to add a label, just press L & R when the Text Entry Screen is displayed, to exit to the Work Page.

4.2.2. COPY

- * Enables you to retrieve a filed drawing from a Library Disk and to include it in a new drawing.

Operation

- 1 Select COPY from Menu 1. The current (last used or default) Library Index is displayed, with an active Copy cursor.

If another Library Index is required, press R for the next index, or L for the previous one.
- 2 Position the cursor over the box containing the required drawing.

NOTE You cannot Copy from an Archive Library Disk.

- 3 Press T to select the drawing. The Work Page is re-displayed and the Copy palette selected.

The Copy palette provides the options available with COPY

SCL 100.0 ROT 0 COMP 0 X FLIP Y  |—|

- | | |
|--------------------|---|
| SCL (Scale) | - The scale of the Copy can be set between 4% and 100% of original size, in steps of 0.5%. |
| ROT (Rotation) | - The Copy can be rotated through 360 degrees in 5 deg. steps. |
| COMP (Compression) | - The Copy can be rotated through the X and/or Y planes in 1 deg. steps. |
| FLIP (X & Y) | - The Copy can be 'mirrored' in the X and/or Y axes. The 'T' marker at the centre of the cursor indicates the two axes. |
| COLOUR Override | - The Colour of the original drawing can be changed on Copy. All data in the original is drawn in the new colour. |
| LINE TYPE Override | - The Line Type of the original drawing can be changed on Copy. All data in the original is drawn in the new line type. |

All COPY options can be used in any combination.

4.2.2. COPY (Cont.)

- 4 Rotate Z to set the SCL (Scale) of the Copy. To 'lock' the Scale, toggle the SCL indicator on the palette; toggle again to unlock.
- 5 If ROT (Rotation) required : Hold down L and rotate Z, release L when set. To 'lock' the Rotation, toggle the ROT indicator on the palette; toggle again to unlock.
- 6 If COMP (Compression) required : Hold down R and rotate Z, release R when set. To 'lock' the Compression, toggle the COMP indicator on the palette; toggle again to unlock.
- 7 If FLIP (Mirroring) required : Toggle X FLIP and/or Y FLIP with the Cursor; toggle again to reset.
- 8 If COLOUR and/or LINE TYPE Override required : Toggle the appropriate indicator on the palette, Hold down L and rotate Z until the required value is displayed, Release L to set. Toggle the indicator again to reset.
- 9 Having set the Copy parameters, position the cursor at the required position and press T to draw the copy.
- 10 Further Copies can be drawn, altering any of the Copy parameters before actioning, if required.

SEE Section 4.7. For the use of COPY with GRIDS.

Escape

Press L & R together.

4.3.1. UNDO

- * 'Backtracks' one step - erasing the last item entered, or restoring the View after a ZOOM.

Operation

- 1 Select UNDO from Menu 1, by pressing L & T .
- 2 If the previous action was a 'Create' function - a DRAW, PAINT, TRACE or TEXT entry, or a COPY, then that item is automatically erased on selection. The cursors are restored to their previous positions to enable a 're-try'.
- 3 If the previous action was a ZOOM (or PAN), then the drawing is restored to its previous view.

Escape

UNDO exits automatically.

4.3.2. ERASE

- * Enables you to step through a drawing to delete any items that are incorrect or not required.

Operation

- 1 Select ERASE from Menu 1. The last item entered is indicated by Editing Cursors. The cursors are as follows :

- Line - Two Editing cursors (diamond-shaped) at the start and end points.
- Point - One cursor at the point.
- Arc - Three cursors at the centre, start and end points.
- Circle - Three cursors at the centre and two circumference points.
- Nib - Four cursors at the corners of the nib block.
- Paint - One cursor at the start point.
- Trace - Two cursors at the start and end points.
- Text - Text cursor enclosing the text block.
- Copy - Copy cursor enclosing the Copy item.
Note : Because Copy items are treated as single modules, ERASE deletes the entire Copy.

- 2 Press L to step back through the drawing, in the reverse sequence of the drawing's assembly. Each item is successively indicated by the Editing cursors. Release L when the required item is indicated.

Similarly, press R to step forward through the drawing, in the sequence of the drawing's assembly, and release R when the required item is indicated.

- 3 When the item is indicated, press T to erase. The item is permanently erased from the drawing, and the Editing cursors move to the previous item in sequence.

If both T and L are held down, a 'continuous erase' results; likewise, holding down T and R results in a continuous erase in the forward sequence. If all items are erased, the function is automatically exited.

- NOTE If the erased item is a PAINT, the colour area is marked with an 'X', but remains on screen until the drawing is regenerated via PAGE, ZOOM or PAN.

Similarly, use PAGE, ZOOM or PAN to restore any partial erasure of underlying items after the use of ERASE.

4.3.2. ERASE (Cont.)

NOTE If, following the use of ZOOM, the entire item is not on screen, use PAN to move the target item onto screen for erasure. Alternatively, apply a 'reverse zoom' (ZOOM, Section 4.4.1.).

SEE Section 4.5.1. LOAD enables the erasure of the components in Library items.

Escape

Press L and R together.

4.3.3. MOVE

- * Enables adjustment in the positioning of COPY items. Copy parameters can be changed in the process.

Operation

- 1 Select MOVE from Menu 1. The Copy cursor replaces the previous cursor and frames the last Copy item entered. The Copy palette replaces the current palette
- 2 Press T to select the Copy item for re-specification.

The selected item is indicated with a static Copy cursor, and an active Copy cursor allows you to re-position the Copy, and, if necessary, change (and lock) any of the Copy parameters as described for COPY (Section 4.2.2).
- 3 When the Copy cursor has been re-positioned, press T to draw. The old Copy is erased, and re-drawn in the new position.
- 4 The same Copy item can be moved again, if necessary, by repeating the above procedure.

To select a Copy item earlier in the drawing sequence, press L to step back through the drawing as described for ERASE (Section 4.3.2.). Each Copy item is indicated by a Copy cursor; release L when the required Copy item is framed. Similarly, press R to step forwards through the drawing, and release R when the required Copy item is framed.

Escape

Press L and R together.

4.3.4. DUPL (DUPLicate)

- * Enables you to pick up a Copy item from the Work Page and draw further Copies (without going to the Library).

Operation

- 1 Select DUPL from Menu 1. The Copy cursor replaces the previous cursor and frames the last Copy item entered. The Copy palette replaces the current palette.
- 2 Press L to step back through the sequence of Copy items, and press R to step forward through the sequence, as described for ERASE (Section 4.3.2.). Release when the required Copy item is indicated.
- 3 Press T to pick up the framed Copy item. The Copy cursor becomes active, and, if necessary, you can change (and lock) any of the Copy parameters as described for COPY (Section 4.2.2.).
- 4 Press T to draw another Copy of the selected item. Further copies can be drawn if required.

Escape

Press L & R together.

4.3.5. EXCH (EXCHange)

- * Enables you to replace Copy items on the Work Page with another from the Library.

Operation

- 1 Select EXCH from Menu 1. The current (last used or default) Library Index is displayed, with an active Copy cursor.

If another Library Index is required, press R for the next index or L for the previous.
- 2 Position the cursor over the box containing the required drawing.
- 3 Press T to select. The Work Page is re-displayed, with the Copy cursor framing the last Copy item entered. Press L to step back or R to step forward through the sequence of Copy items. Release when the required Copy item is framed.
- 4 Press T. The Copy item is replaced by the new selection, at the same Scale, Rotation, Compression, etc. These parameters cannot be changed in EXCH.
- 5 If required, another Copy item can be selected for replacement with the new item by repeating the procedure.

Escape

Press L and R together.

4.4.1. ZOOM

- * Enables you to both expand a selected area of the drawing to the full size of the work page (zoom in), and also to contract a zoomed view into a selected area (zoom out).

Operation

- 1 Select ZOOM from Menu 1. The Zoom Cursor replaces the previous cursor.
- 2 Move the Zoom cursor to the centre of the area to be enlarged.
- 3 Rotate Z to set the size of the 'window' that defines the area for enlargement.

As you rotate Z, the marker at the centre of the zoom cursor changes between '+' and 'X'. The '+' marker indicates 'zoom in', and the 'X' indicates 'zoom out'.

When you zoom out, the current screen view will be re-displayed in the area enclosed by the zoom cursor.

NOTE You cannot zoom out from the base page view. If attempted, the system issues a warning beep and ignores the command.

- 4 When the area has been selected, press T to perform the zoom. The display of the new view of the drawing can be halted by pressing the keyboard SPACE BAR.
- 5 If further expansion (or contraction) of the drawing is required, perform a further zoom as described.

SEE Section 4.7. For the use of ZOOM with GRIDS.

Escape

Press L and R together.

4.4.2 PAN

- * Enables you to display adjacent areas to a zoom view.

Operation

- 1 Select Pan from Menu 1. The Zoom Cursor replaces the previous cursor.
 - 2 Move the cursor to include the off-screen area to be viewed.
- NOTE You cannot pan from the base page view. If attempted, the system issues a warning beep and ignores the command.
- 3 When the area has been selected, press T to perform the pan. The display of the new view of the drawing can be halted by pressing the keyboard SPACE BAR.

Escape

Press L and R together.

4.4.3. PAGE

- * Re-displays the drawing at base page view. It can be used following changes or deletions to the drawing, or for 'returning' from a zoom view.

Operation

- 1 Select PAGE from Menu 1.
- 2 The drawing is re-displayed at the base page view. The display of the drawing can be halted by pressing the keyboard SPACE BAR.

Escape

PAGE exits automatically after displaying the drawing.

4.5.1. UTILS (UTILitieS)

- * Provides an additional Menu, presenting several utility functions.

Operation

- 1 Select UTILS from Menu 1. The UTILS MENU is displayed, with an active menu selection bar. The bar can be moved up and down the menu using the controller. Position the bar over the required option and press L to make a selection.

- 2 UTILS provides the following functions :

LOAD LIBRARY	- Retrieves a drawing from a Library Disk to enable modification.
LOAD WORKPAGE	- Retrieves a drawing used as a module in another drawing to enable modification.
ZOOM SAVE	- Temporarily stores a zoom view.
ZOOM LOAD	- Retrieves the stored zoom view.
SET TEXT SIZE	- Re-defines the absolute text height when drawing in SCALE Mode.
TABLET ON/OFF	- Enables the use of a Digitizer Tablet as an alternative X-Y input.
IMAGE FULLSIZE	- Regenerates a drawing at full screen size (without Menu and Palette).
IMAGE SAVE	- Stores the screen contents on a Library disk.
IMAGE LOAD	- Retrieves a stored screen image.
IMAGE PRINT	- Prints the screen contents on a suitable dot matrix printer.
IMAGE CATALOG	- Lists all screen images stored on a Library disk.
BOOT DRIVE 1	- Re-boots a program disk in Drive 1.

The use of these functions is described in the following pages.

Escape

Press L and R together.

4.5.1. UTILS : LOAD LIBRARY

- * Enables you to retrieve a filed drawing from a Library disk for editing or adding further detail.

If you have 'backed up' a drawing in progress, use this function to retrieve the drawing for continued work.

This function, therefore, treats the drawing as the set of individual items from which it is compiled rather than as a single module (for which the COPY function is used).

Operation

- 1 Select LOAD LIBRARY from the Utils Menu. The current (last used or default) Library Index is displayed with an active selection cursor.
- NOTE This function will WIPE the Work Page when selected - if you want to save the current work, FILE before selection.
- 2 Position the cursor over the box containing the required drawing.
 - 3 Press T to load the drawing. The Work Page (and memory) are cleared of any current drawing, and the loaded drawing is displayed.

Escape

When loading is complete, the system is in DRAW.

4.5.1. UTILS : LOAD WORKPAGE

- * Operates in the same way as LOAD LIBRARY, but enables you to select a Copy item from the Work Page, discarding the remainder of the drawing, and to Load the item for editing or amendment.

This function can be used to edit Copy items in 'composite' drawings which contain a number of Copy items.

Operation

- 1 Select LOAD WORKPAGE from the Utils menu. The Copy Cursor frames the last Copy item entered.
- NOTE This function will WIPE the Work Page when selected - if you want to save the current work, FILE before selection.
- 2 Press L to step back through the sequence of Copy items, and press R to step forward through the sequence, as described for ERASE (Section 4.3.2). Release L when the required Copy item is indicated.
- 3 Press T to load the framed Copy item.

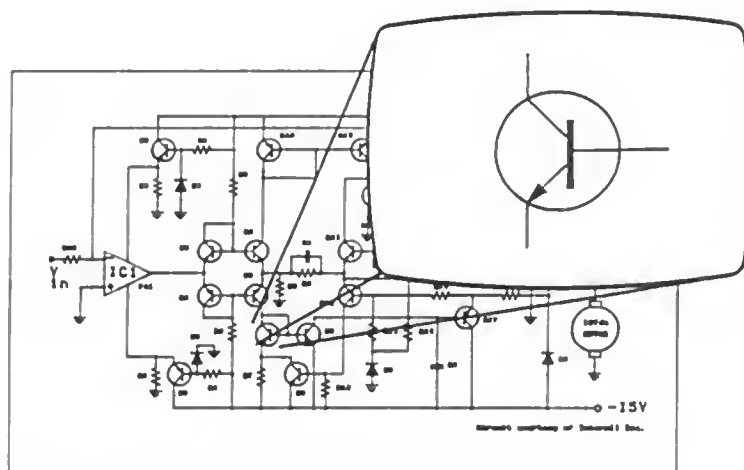
The Work Page (and memory) are cleared of the current drawing, and the selected Copy item is displayed.

- NOTE Having amended the selected Copy item, it can be saved on the Library disk via FILE; you can then re-load the original drawing and use EXCH to replace the previous version of the Copy item with the new amended version.

If the selected Copy item contains lower levels of 'nested' Copy items, you can repeat the process to isolate and extract a lower level item for editing.

Escape

When loading is complete, the system is in DRAW.



4.5.1. UTILS : ZOOM SAVE

* Enables you to temporarily store a Zoom view.

Operation

- 1 Select ZOOM SAVE on the Utils menu.
- 2 On selection, the current Zoom position and magnification is stored in memory.

Escape

ZOOM SAVE exits automatically.

4.5.1. UTILS : ZOOM LOAD

* Enables you to retrieve a previously saved Zoom view.

Operation

- 1 Select ZOOM LOAD from the Utils menu.
- 2 On selection, the current drawing is re-generated at the saved Zoom position and magnification.

Escape

ZOOM LOAD exits automatically.

4.5.1. UTILS : SET TEXT SIZE

- * Enables you to re-specify the Text size when operating in SCALE mode (see Section 4.9).

Operation

- 1 Select SET TEXT SIZE from the Utils menu. A screen is displayed requesting Text scale and size values.

```

  SET TEXT SIZE
  -----
  ENTER PLOT SCALE      1.0
  ENTER TEXT HEIGHT (MM) 1.0
  -----
  PRESS <ESC>          TO CANCEL

```

- 2 Enter, on the keyboard, the intended Plot scale of the drawing, terminating with RETURN.
- 3 Enter the absolute text size to appear when the drawing is plotted (eg 3.5 mm.), terminating with RETURN.

SEE Section 4.9.1. for the use of TEXT in SCALE.

Escape

SET TEXT SIZE exits automatically.

4.5.1. UTILS : TABLET ON/OFF

- * Allows you to switch a Digitising Tablet 'on-line' or 'off-line' if one is installed. When selected, the Tablet provides the same X-Y input as the standard controller.

Operation

- 1 Before use, ensure that the following System Menu options have been performed -
 - (i) Configure System : slot specified for Tablet interface card
 - (ii) Set up Tablet : Tablet specified.Then perform the 'RESET' procedure described in the Tablet User Manual, to establish the correct reference point.
- 2 Select TABLET ON/OFF from the Utils menu. Press L & R to return to the Work Page.
- 3 The Tablet provides the X-Y input of the controller by moving the stylus (or keypad, depending on the type of tablet) over the tablet surface, but without pressing the stylus down.
- 4 Palette selection is made by moving the stylus to the bottom of the tablet.

Menu selection is made by pressing the stylus (or keypad button), moving the stylus/keypad in the Y-direction (at any X position) to the required menu option, and selecting with L on the controller.
- 5 Update the Origin Cursor by positioning the stylus/keypad at the required location, and pressing L on the controller.
- 6 Enter the item (line, arc, etc.) by moving the stylus or keypad to the required position and pressing T on the controller.

Escape

To switch off Tablet input, re-select TABLET ON/OFF.

4.5.1. UTILS : IMAGES

- * An 'IMAGE' is the static screen display (ie mosaic of 'pixels' on the screen) rather than the re-playable list of individual lines, arcs, etc. The following group of functions enable various operations on Images.

UTILS : IMAGE FULLSIZE

- * Enables you to view the current drawing at full screen size, without the Menu and Palette. This view can be printed or photographed from the screen using an appropriate sub-system.

Operation

- 1 Select IMAGE FULLSIZE from the Utils menu.
- 2 On selection, the Menu and Palette are removed, and the current drawing is re-generated at full screen size.
- 3 Press T to directly select IMAGE SAVE (see below), which enables you to store the full size image on disk.

Escape

Press L & R together. The Menu and Palette are redisplayed, and the drawing re-generated at base scale.

4.5.1. UTILS : IMAGE SAVE

- * Allows you to store a screen image on disk. It is recommended that you format some disks especially for this purpose, using the 'Initialise disk' facility on your 'DOS System Master'.

The images that you save are in the APPLE 'Picture' format, and are therefore fully compatible with other software products.

Operation

- 1 Select IMAGE SAVE from the Utils menu.
- 2 Enter a name for the image, for subsequent reference, terminating the entry with RETURN.

Escape

IMAGE SAVE exits automatically.

4.5.1. UTILS : IMAGE LOAD

- * Allows you to re-load a previously stored Image from disk, for viewing or printing (see IMAGE PRINT below).

Operation

- 1 Select IMAGE LOAD from the Utils menu.
- 2 Enter the name of the required Image, terminating with RETURN. (You can review the Image names on the disk via IMAGE CATALOG, described below).
- 3 The selected Image is displayed on the screen.

Escape

IMAGE LOAD exits automatically.

4.5.1. UTILS : IMAGE PRINT

- * Allows you to print the screen contents on a suitable dot-matrix printer.

Operation

- 1 Before use, ensure that the following System Menu options have been performed -
 - (i) Configure System : slot specified for the Printer interface card
 - (ii) Set up Printer : correct Printer interface card specified.
- 2 Select IMAGE PRINT from the Utils menu.
- 3 Follow the prompt to align the printer paper. Press RETURN when ready.
- 4 The screen contents is printed.

NOTE Most printer interface cards which support the necessary 'Graphics Dump' option, enable a wide range of manipulation to the image being printed. Refer to the manual supplied with the card for the 'Command Codes' for these facilities. Use the 'USER-DEFINED' option on 'SET UP PRINTER' to achieve the required effects.

Escape

IMAGE PRINT exits automatically on completion of the print.

4.5.1. UTILS : IMAGE CATALOG

- * Allows you to review the contents of a disk containing Images, and to delete any unrequired images.

Operation

- 1 Select IMAGE CATALOG from the Utils menu.
- 2 On selection, the Image Catalog is displayed.
- 3 To delete an image, press T and enter the name of the image when prompted.

Escape

IMAGE CATALOG exits automatically.

4.5.1. UTILS : BOOT DRIVE 1

- * Allows you to re-load the System Menu to perform any functions provided there, or to 'boot' another software disk - for instance, the PLOTTER SOFTWARE disk.

Operation

- 1 Select BOOT DRIVE 1 from the Utils menu.
- 2 On selection, a prompt requests you to insert the required software disk in Drive 1, and to press T when ready.

Escape

This function exits from the system.

4.5.2. WIPE

- * Clears the current drawing from the screen and memory , and resets all system defaults.

Operation

- 1 Select WIPE from Menu 1, by pressing L & T.
- 2 On selection, the screen is cleared, and any drawing in memory is erased. All system defaults are restored.

Escape

WIPE exits automatically.

4.5.3. FULL

- * Removes the current Palette from the screen to allow drawing over the full vertical range.

Operation

- 1 Select FULL from Menu 1 or Menu 2.
- 2 On selection, the current Palette is removed.

Escape

Re-select FULL to replace the current Palette.

4.6.1. ANGLE

- * Enables you to set two angle 'locks', X and Y, in degrees, minutes and seconds.

Operation

- 1 The top group of three numerals beneath the 'ANGLE' legend denotes the X degrees, minutes and seconds respectively; the lower group denotes the Y values.
- 2 Move the cursor to the 'X Degrees' indicator, hold down L and rotate Z. The value can be adjusted in the range 45-0-45 degrees, with the marker indicating the 'East' or 'West' quadrant. Release L when the required value has been set.
- 3 Repeat step (2) for 'X Minutes' and 'X Seconds' if required.
- 4 Repeat for 'Y' Degrees (plus Minutes and Seconds if required). The degrees values is adjustable in the range 45-90-45 degrees, with the marker indicating the 'North' or 'South' quadrant.
- 5 Select 'ANGLE', confirming with L.
- 6 The cursor becomes constrained along the defined angle paths, enabling items to be drawn and copies placed at the specified angle.

Hold down R to free the cursor from the lock.

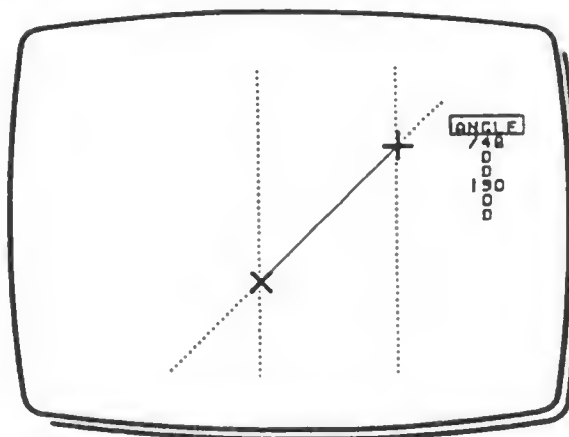
Escape

Re-select 'ANGLE' and press L, or select ORTH / N-TAN.

```

ANGLE
— 0
' 0
" 0
| 90
' 0
" 0

```



4.6.2. ORTH (ORTHogonal)

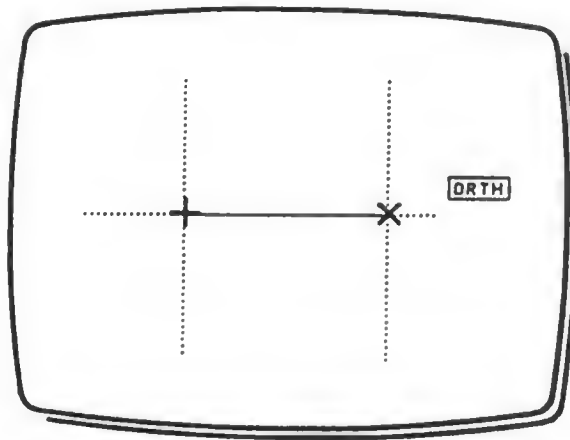
- * Provides a fixed 0/90 degree angle lock. (These are the default values for the variable angle locks described above).

Operation

- 1 Select ORTH from Menu 2.
- 2 Once selected, the cursor can only move horizontally or vertically.

Escape

Re-select 'ORTH' and press L, or select ANGLE / N-TAN.



4.6.3. N-TAN (Normal-TANGent)

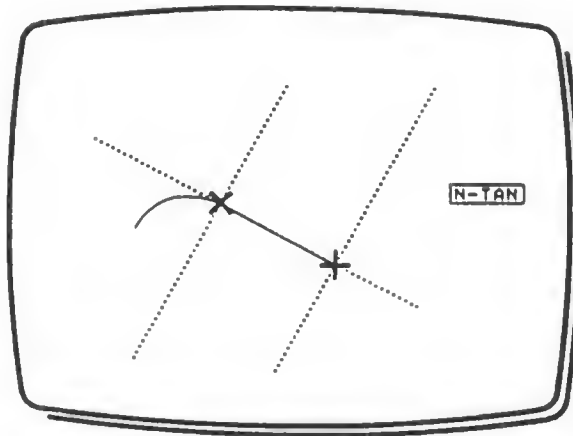
- * Generates an angle lock tangential to the previous line or arc entered, plus the normal (ie 90 deg) to the tangent.

Operation

- 1 Select N-TAN from Menu 2.
- 2 The cursor becomes locked to the tangent of the last item entered, plus the normal to the tangent.

Escape

Re-select 'N-TAN' and press L, or select ANGLE / ORTH.



4.7.1. GRID I

- * Provides a 'default' 8 x 8 grid (ie 8 screen points, or pixels, square).

It is particularly useful for the construction of schematic drawings.

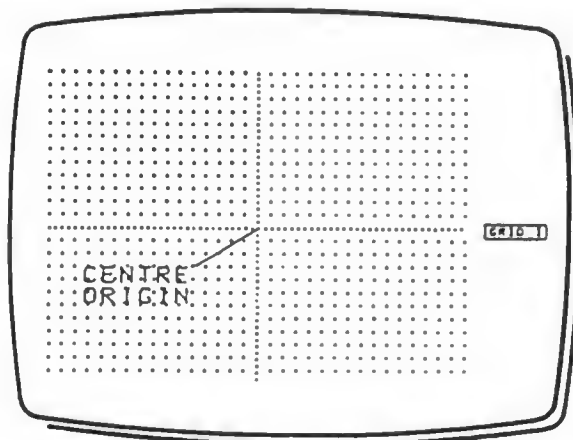
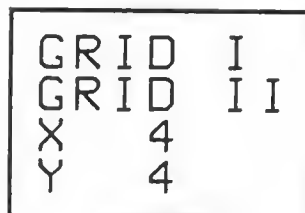
Operation

- 1 Select GRID I from Menu 2. An 8 x 8 grid is displayed on the Work Page, with cross-hairs indicating the centre of the page.
- 2 Once selected, cursor movement is restricted to the array of grid points. To free the cursor from the grid, hold down R.

SEE Section 4.9.1. for the use of GRID I in SCALE mode.

Escape

Re-select GRID I from the menu.



4.7.2. GRID II

- * Provides a definable grid, with the X and Y (horizontal and vertical) grid spacings individually adjustable between 4 and 32 pixels. The pitch of the grid can be set using an Angle lock.

Operation

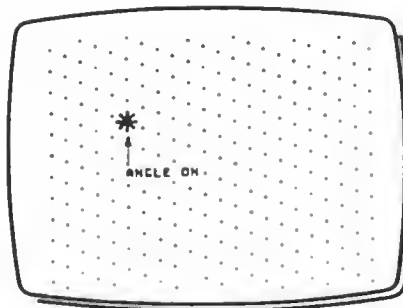
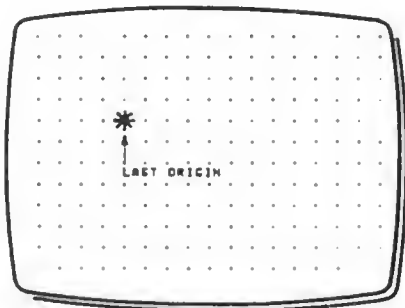
- 1 Beneath the 'GRID II' legend are two numerals, indicating the X and Y grid spacings respectively.

Move the cursor to the 'X' spacing value, hold down L and rotate Z until the required value is displayed. Release L to set the value.
 - 2 Repeat for the 'Y' spacing.
 - 3 Position the cursor at the location from which the grid is to be sourced.
 - 4 Select GRID II from the Menu.
 - 5 Once selected, cursor movement is restricted to the array of grid points. To free the cursor from the grid, hold down R.
 - 6 If you need an angled grid, set and switch on the required Angle lock before you switch on Grid II.
- SEE Section 4.9.1. for the use of Grid II in SCALE mode.

Escape

Re-select GRID II from the Menu.

GRID	II
X	10
Y	10



4.8.1. FIND

- * Enables you to establish the Origin cursor at the exact end points of existing entries. It can be used to establish the start point of a new item or to set up an Arc or Grid.

Operation

- 1 Select FIND from Menu 2. The end point of the last item entered is indicated by an Editing cursor.
- 2 Step back or forward through the drawing by pressing L or R to identify the required point.
- 3 Having identified the required point, press T to update the Origin cursor to this point.

Escape

Press L & R together.

4.8.2. POINT

- * Enables you to establish a single Point lock - similar to a Grid, but consisting of only one point - sourced at the position of the Origin cursor.

Operation

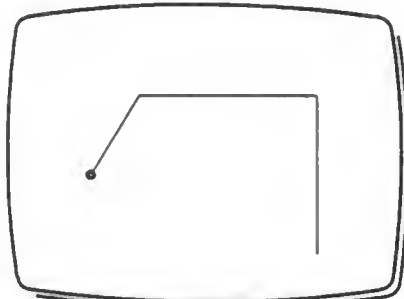
- 1 Update the Origin cursor to the required point.
- 2 Select POINT from Menu 2.
- 3 The Dynamic cursor becomes locked at the defined point.

If in DRAW (LINE), you can draw a single point by pressing T.

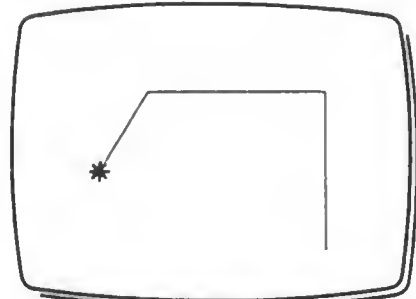
- 4 If you need to establish two 'found' points (eg to join two lines), use POINT to set a Point lock at one location, then use FIND to establish the second point. You can then draw back to the first position.

Escape

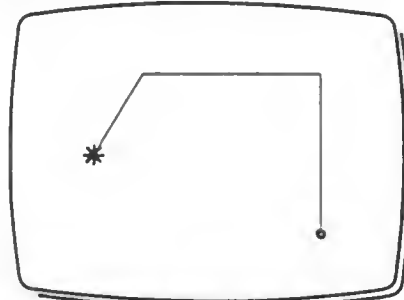
Re-select POINT from the Menu.



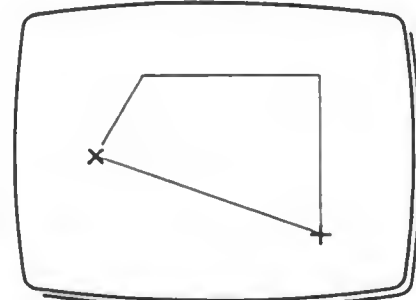
FIND 1st point - set origin



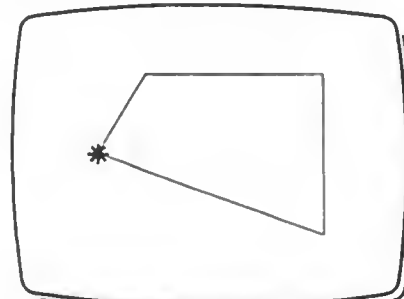
Switch POINT on.



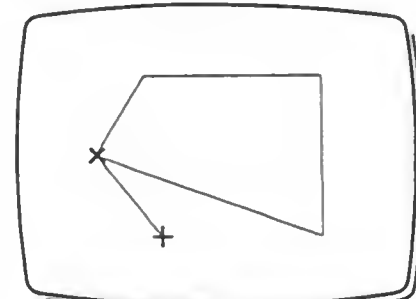
FIND 2nd point.



Line snaps to 1st point.



Confirm line with T.



Switch POINT off.

4.9.1. SCALE

- * Enables a drawing to be produced in a true scalar fashion. It provides the facility to establish an absolute size for the Work Page, and to define all components of the drawing numerically via the keyboard.

Operation

- 1 Select SCALE from Menu 2. A screen is displayed requesting the Scale Page Size (ie width).

```

  SET PAGE SIZE
  -----
  PAGE SIZE      B
  UNITS (MM/M/KM/IN/PT):
  -----
  PRESS <ESC>    TO CANCEL

```

- 2 Enter from the keyboard the Page Size required, terminating with RETURN.

A maximum of 5 figures (4 with decimal point) can be entered up to the following allowable maximums :

IN	-	9846	MM	-	98460
FT	-	98460	M	-	984
			KM	-	984

- 3 Enter the Units for the value, terminating with RETURN.

If the attempted entry is illegal, you will have to re-enter the value and units.

NOTE The DIMN function (See Section 4.9.2.) uses the units that have been specified for the Scale Page. So, if you want to dimension a drawing in MM., specify the overall size of the Base Page in MM. Similarly for M, KM, IN and FT.

4.9.1. SCALE (Cont.)

- 4 When the Page size has been specified, the Work Page is redisplayed, with the following information at the top of the screen :
- VIEW : current size of Work Page
GRID : Grid size (only displayed when GRID selected)
LEN(gth) : Line length, dynamic display
- 5 As the cursor is moved, the LEN display shows the scaled line length.
- 6 To enter components of the drawing numerically from the keyboard, either an ANGLE lock or a GRID must be active.
- To select ANGLE lock, See Section 4.6.
- To select a GRID, See Section 4.7.
- 7 Once an ANGLE lock or GRID is set, the system will accept keyboard input for the specification of the data entries.
- The numeric entry is confirmed by pressing either RETURN or T, but the use of RETURN is preferred.
- The remainder of this section describes the use of the following functions in SCALE mode :
- DRAW : LINE
RADIAL and COMPASS ARC
CIRCLE
TEXT
COPY
ZOOM / PAN
GRIDS

Escape

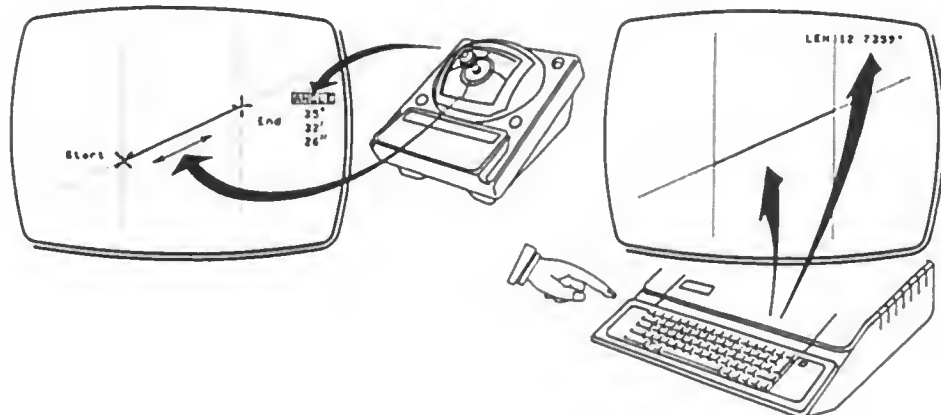
Re-select SCALE from Menu 2.

4.9.1. SCALE : LINE

- 1 Select LINE, if not already active.
- 2 Set the start position of the Line, by updating the Origin cursor with L, using an Angle Lock to set the line angle.
- 3 Position the Dynamic cursor to establish the direction of the line.
- 4 Enter the length of the line on the keyboard - the entered value is displayed at the top the screen - terminating the entry with RETURN.

On pressing RETURN, the Line is drawn to the specified length.

- NOTE If you are working in FT. and IN., you must press RETURN when the Feet have been entered, then enter the Inches (with fractions expressed decimally) and again press RETURN.
- 5 If you want to update the Origin cursor by a precise amount, enter the required value on the keyboard, but press the SPACE BAR instead of the final RETURN.

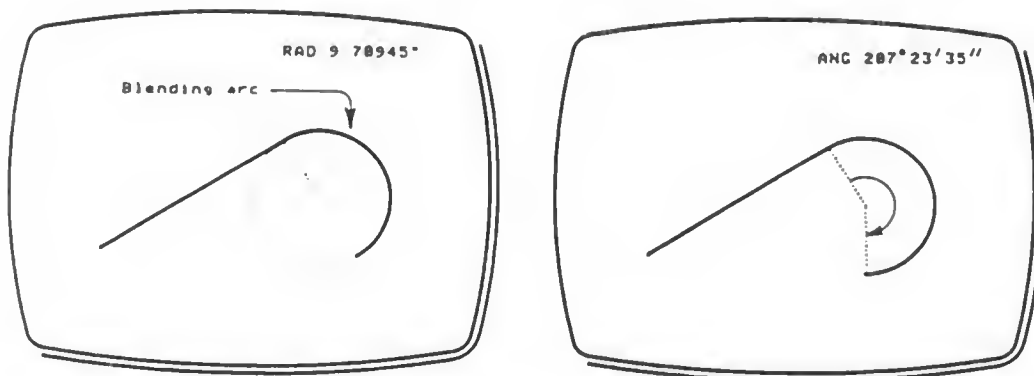


4.9.1. SCALE : RADIAL ARC / COMPASS ARC

- 1 Establish the start position for the arc (ie circumference point for RAD ARC or centre for COMP ARC), using an Angle Lock to set the start angle.
- 2 Select RAD ARC or COMP ARC from the palette.
- 3 Enter the required Radius on the keyboard - the value entered is displayed as 'RAD' at the top of the screen - terminating the entry with RETURN.
- 4 Enter the required degrees of Angle on the keyboard - the value entered is displayed as 'ANG' at the top of the screen - followed by RETURN. Then enter the Minutes and Seconds following each with RETURN.

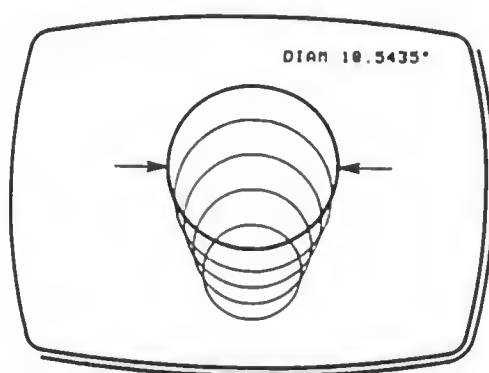
If you only require Degree precision, follow the degree entry with 3 presses of RETURN to skip minutes and seconds.

On pressing the final RETURN, the Arc is drawn with the specified Radius and Angle.



4.9.1. SCALE : CIRCLE

- 1 Select CIRCLE from the palette.
- 2 Establish the origin for the circle, using a POINT or GRID lock if necessary (See Section 4.8.2.).
- 3 Enter the required Diameter on the keyboard - the value entered is displayed as 'DIAM' at the top of the screen - terminating the entry with RETURN.
- 4 On pressing RETURN, the Circle is drawn with the specified radius.



4.9.1. SCALE : TEXT

- 1 Select TEXT from Menu 1. If this is the first selection of TEXT since SCALE was selected, a screen is displayed requesting Text Scale and Size values.

```

      SET TEXT SIZE
-----
ENTER PLOT SCALE      1. ■
ENTER TEXT HEIGHT (MM) 1. ■
-----
PRESS <ESC>          TO CANCEL

```

- 2 Enter on the keyboard the intended Plot scale of the drawing, terminating with RETURN.
- 3 Enter the absolute text size to appear when the drawing is plotted (eg 3.5 mm.), terminating with RETURN.

If the size requested is too small, the value entered is ignored, and the system returns to DRAW.
- 4 On pressing RETURN, the Text Entry Screen is displayed.
- 5 Enter the text line or block, using the editing facilities if required. (SEE Section 4.1.4.).
- 6 When the text has been entered, press L & R to return to the Work Page with the active text cursor.
- 7 Position the text as required, but note that the scale is locked to the size specified.
- 8 Press T to draw the text.
- 9 If you subsequently need to alter the text size, select UTILS : SET TEXT SIZE (See Section 4.5.1.) which enables re-specification of the text scale/size.

4.9.1. SCALE : COPY

If a drawing is produced in SCALE mode, is Filed, and subsequently used as a component in another SCALE drawing, the Copy Scale ('SCL') is locked and cannot be altered.

The correct relative scale between the Copy and the Page size is therefore maintained.

The same constraints apply to the use of the Copy Editing functions (MOVE and DUPL); EXCH, however, cannot be used to replace a Copy of one scale with a different Copy at another scale - the scale of the original Copy prevails.

SCALE : ZOOM / PAN

ZOOM and PAN can be used in SCALE mode to increase the viewable resolution of local areas of the drawing.

'VIEW', at the top of the screen, indicates the size of the current view.

SCALE : GRID I

In SCALE mode, GRID I generates a calculated grid, spaced appropriately according to the units specified for the Page. The spacing value is displayed at the top of the screen.

This grid can be 'zoomed' to increase the spacing resolution.

4.9.1. SCALE : GRID II

In SCALE mode, GRID II enables you to define your own grid spacing.

- 1 Move the cursor to the 'X' value beneath the 'GRID II' legend and press L.
- 2 Type in the required Grid spacing, terminating with RETURN.

 (Use ESC to escape, if you change your mind).
- 3 Repeat for the 'Y' spacing.
- 4 Switch 'GRID II' on.
- 5 As in non-SCALE mode, this grid can be angled by first setting an Angle lock.

NOTE When specifying the X and Y grid spacings, only values which generate usable grids at a given page view will be accepted. If unusable spacings would result from the value entered, the system 'beeps' and expects a new value.

Usable spacings, in pixels, are : Minimum 3 pixels,
Maximum 128 pixels.

Unlike GRID I in SCALE, GRID II preserves the same grid spacing through Zoom. Therefore if you Zoom too far, you can end with a single Grid point on screen (like the POINT lock). Hold down R to escape.

4.9.2. DIMN (DIMensionN)

- * Enables the display and dimensioning of items in a drawing which has been produced in SCALE mode.

Operation

- 1 Ensure that SCALE is selected from Menu 2.
Select DIMN from Menu 2.
- 2 The last item entered is indicated by Editing Cursors (for a list of Editing cursors, see Section 4.3.2.).
- 3 You can step back or forward through the drawing with L or R to select another item.
- 4 When the required item is indicated, press T.
- 5 The Dimension Palette replaces the current palette.



M X LEN Y LEN LEN ANG 0.286558 M DP6

- 6 Different aspects of the item's dimensions can be displayed on the palette by moving the arrowhead marker along the palette :

M / I	- Metric / Imperial display switch. Position arrowhead marker over and press L to switch.
XLEN	- Horizontal length.
YLEN	- Vertical length.
LEN / RAD / DIAM	- Line length / Arc radius / Circle diameter.
ANG	- Angle of Line or Copy from horizontal / Arc angle.
D.P.	- Decimal Places, settable between 0 and 6. Position arrowhead marker over, press L, rotate Z to select value, release L.

4.9.2. DIMN (Cont.)

- 7 Having selected the attribute on the palette, press L.

The Text cursor becomes active, loaded with the displayed value, and can be placed at the required position on the drawing.

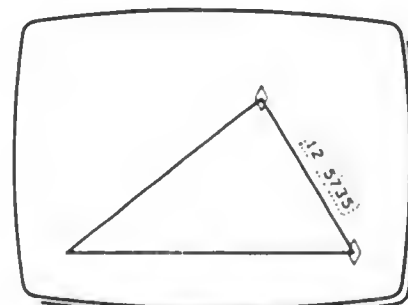
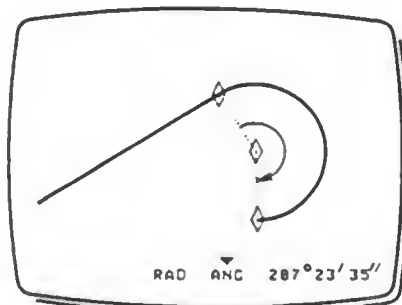
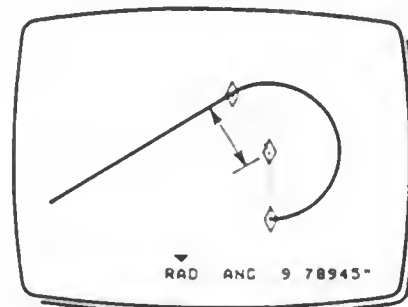
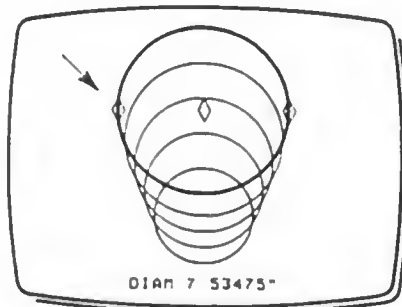
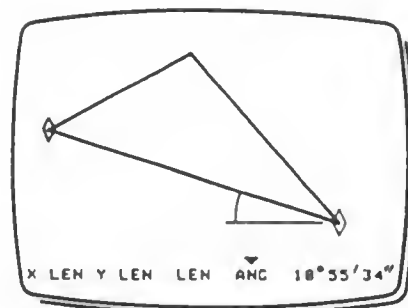
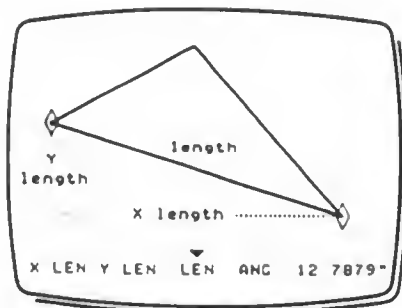
- 8 The text cursor can be rotated by pressing L, and will align to a non-orthogonal line.

When positioned, press T to draw the text.

- 9 Repeat for the next item in sequence, if required.

Escape

Press L & R together.



APPENDIX A THE LIBRARY

One of the system's most powerful features is its Library for storage and retrieval of graphic data. In the following pages, the features of the Library are explained along with a guide to setting up an organised Library system and instructions on Library Disk formatting.

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PLEASE NOTE

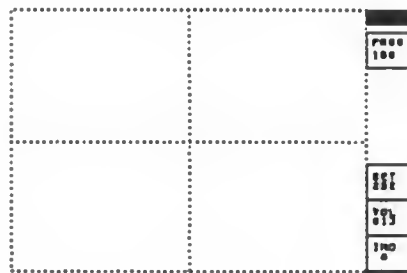
Use only SOURCE DISKS unless you require a full Library Management System - see 'Library Organisation'

A.1. INTRODUCTION

How the Library works

The key to the Library, both for you and the computer, is the Library Index. This gives the user a visual catalog of the Library contents, and it also provides the means for the computer to identify any element simply by its location on the Index page.

When you FILE a drawing, the set of instructions relating to that drawing is identified by the system through its location code in the library, not by its visual appearance. This code is generated automatically by the system when the drawing is filed. This is not the same as the 'label' which you may assign to a drawing via the keyboard when filing. The label is written on the index page as a visual reminder only, and has no meaning to the system.



The code has four elements :

SET NUMBER - 1 to 63

VOLUME NUMBER - 1 to 254

INDEX PAGE - A B or C

BOX LOCATION - 0 to 63

This coding scheme allows the system to recognise more than 3 million unique Library locations.

Each box on the Index represents a specific drawing file - a permanently stored set of instructions which can be used any number of times to regenerate the drawing on the screen (the Work Page) or plotter.

Miniature images, or 'icons', on the Index are a visual directory of library contents, allowing drawings to be retrieved without using keyboard-entered codes.

The system's internal location coding, ie File numbering, is from left to right, and top to bottom, starting at '0'. Each Index can be formatted with 4, 16 or 64 boxes.

A.1. INTRODUCTION

Capacity of Library Disk

In the system, drawings are stored in a highly compressed form. Exactly how many drawings you can store on a single disk depends on the complexity of the drawings, i.e. how many lines, arcs, copies, etc. A single library disk can store about 10,000 lines and arcs.

Although untypical, this limit can be reached by only one or two very complex drawings. In this case, the library disk would be full even though all the remaining boxes on the index pages are empty.

A library disk can also be filled by using large numbers of different COPIES. Each COPY needs to be logged in the library disk's Directory and takes a minimum of 2 'sectors' of the disk. The library disk Directory has a capacity of 200 entries, so that a disk formatted as (64,64,64) could potentially contain 192 drawings, leaving only 8 spare directory entries for COPIES included in some of the drawings.

A.2. USING THE LIBRARY

Library Organisation

The ROBO 1500 System offers a very versatile Library system which can provide effectively unlimited storage for your drawings.

However, in order to avoid the possibility of conflicting Library entries when a number of systems are used by different users in the same organisation, it is essential that the Library is used in an organised way from the start.

If you are the only user of the system, then it is less important to employ the full Library Management organisation detailed below providing you follow these basic rules :

- * ONLY USE SOURCE DISKS FOR ALL YOUR DRAWINGS, BOTH COMPLETE AND PARTIAL DRAWINGS
- * SOURCE DISKS ARE LIBRARY DISKS WITH VOLUME NUMBERS 13 - 253
- * NEVER USE MORE THAN ONE SOURCE DISK WITH THE SAME SET & VOLUME NUMBER

There are no restrictions on what can be filed or copied with Source Disks as each item has a unique location code.

Using Source Disks alone provides more than 3 million unique locations; if you reach the stage where you need further capacity, you can adopt the procedures detailed below in 'Library Management'.

Library Management

In the system, all drawings are saved on Library disks. This includes any drawing you are currently compiling , and also your permanent store of source material such as symbols, frequently used components or 'modules', blocks of text, typefaces, etc.

You can develop your own library disks of standard source material, which can be freely duplicated and used throughout your organisation - this can assist in standardising drawing practices. Additionally, pre-drawn 'Robo' Library Disks, based on commonly used standards, are available for many applications, including Architecture, Electronics, Fluid power, Process engineering, Business presentation, and Typefaces.

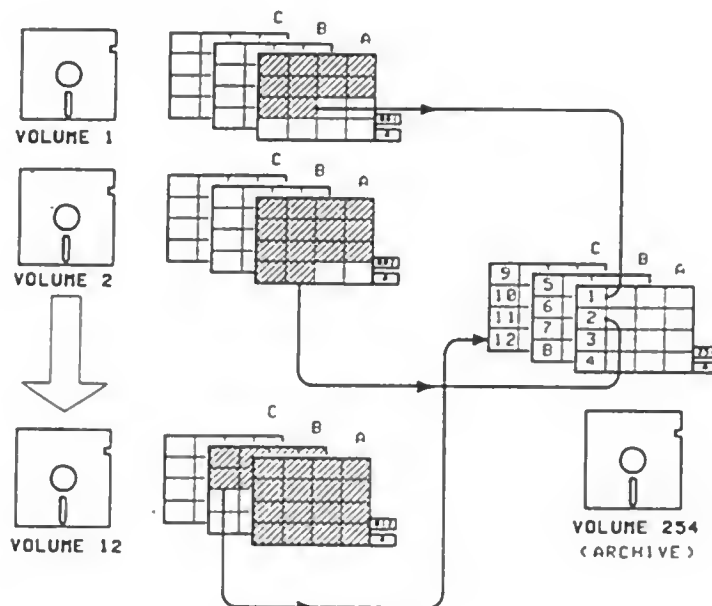
The floppy disk is a very convenient storage medium - unlike physical drawings and microfilms, library disks store your drawings in a compact form that can be edited, manipulated and combined with other data. Further, a properly structured Library disk can be a pictorial catalog - a visual bill of materials - of all the component parts or stages leading to the finished drawing.

A.2. USING THE LIBRARY

Structuring your Library

Although all library disks are organised in a similar way, they fall into three distinct categories -

- 'Compiler' (Vols 1 - 12) for interim assembly and edit of drawings.
- 'Source' (Vols 13 - 253) for permanent storage and retrieval of pre-drawn source material; originated by the user or Robo-supplied.
- 'Archive' (Vol 254) for permanent storage of finished drawings.

Disk Numbering

Because the Library coding uses the Volume Number as part of the 'unique' tag for any particular file, it is very important to avoid common Volume Numbers. Otherwise, the code ceases to be unique resulting in the danger of 'duplicate' items corrupting your drawings.

A.2. USING THE LIBRARY

Using Compiler Disks

The 12 Compiler Disks in each Set are used for the production and assembly of up to 12 different drawings (1 per disk). This means that, at any given time, you can work on up to 12 drawings at various stages of completion. When you have finished a drawing, you 'archive' it, using an Archive Disk. You can then re-use that Compiler volume number (but not the disk itself, which should be filed away with the Archive Disk).

Every group of 12 Compiler disks relates to a given Archive Disk. The Archive Disk can be formatted as 4,4,4 to provide 12 boxes for each of the finished drawings 1-12. Alternatively, if you want to store additional information relating to a drawing (modifications, plotting details, etc), you can format the Archive disk as 16,16,16. This allows you to use one row of 4 boxes on the 3 index pages for each of the 12 drawings. More information on the use of Archive Disks is given below.

When using Compiler disks, follow these rules :

- * Store the Compiler Disk with its related Archive Disk
- * Don't discard or re-use the Compiler disk
- * Ensure the disk is properly labelled

The Compiler disk should be formatted with 16 boxes per Index, which should be adequate for most drawings. If you anticipate that you will need more than 48 boxes for compilation and editing, format the Compiler disk with at least one 64-box index. Similarly, if you are working on a large drawing and want more detail displayed on the index page than the 16-box format provides, format the Compiler disk with at least one 4-box index.

Before beginning a drawing, check for any repeated elements which you don't have on a Source disk. Draw these first, filing each element separately on the Source disk. Use the index boxes in sequence, from left to right and top to bottom. Then develop the drawing to completion, using a FILE-WIPE-COPY procedure, if necessary, from large 'multi-layer' drawings.

When the drawing is completed, FILE it on the Compiler disk, then LOAD it and re-FILE it on the Archive disk.

A.2. USING THE LIBRARY

Using Source Disks

Source Disks are used for storing common 'template' material - schematic symbols, components, and other frequently-used part drawings. Source material is permanent, read-only data.

This material should not be modified without a formal 'change approval' procedure. This need not apply if you are the sole user of the system in your organisation, and you don't plan to trade disks with others. However, if there are multiple users in the one organisation, all should have identical source material eg all copies of Volume 53 should be the same in every detail. Although the safest way of ensuring this is to have only one disk labelled 'Vol 53', most users will want their own copy. You can make as many back-up copies of source disks as you need, as described in Section 2.4.

When assembling Source disks, follow these rules :

- * Where possible, use 'new data' rather than copied items from other source disks.
- * Never assemble source material on a disk other than the one on which it will eventually be permanently filed.
- * Never use as source material items taken from outside the 'Source material domain', ie never use anything from an Archive disk or from a Compiler volume.
- * Apply a write-protect tag to Source disks before distribution

A.2. USING THE LIBRARY

Using Archive Disks





The Archive disk is intended to always be the 'safe-deposit' for the latest version of a drawing, like a master plan chest. If you want to be sure of up-to-date information, it is always the Archive disk you refer to, not the Compiler disk.

Unlike Compiler or Source disks, you cannot COPY from an Archive disk, only LOAD.

The simplest way to use the Archive disk is on a one-to-one relationship between the Compiler disk and the Archive index box - where the drawing from Compiler Volume 1 is filed on Archive index box 1, Compiler Volume 2 on Archive index box 2, and so on up to Compiler Volume 12 on Archive index box 12. In this case, the Archive disk would be formatted (4-4-4) to provide the 12 index boxes.

However, you may need to store additional information relating to the drawing. In this case, format the Archive disk (16-16-16) and follow this recommended scheme :

- * Each of the Compiler volumes (and hence completed drawings) occupies one complete row of an index.
- * Box 1 stores the completed drawing.
- * Box 2 stores the border, title block and other 'graphic' material relating to the drawing, but plotted separately. (Some users prefer to include all of this with the 'Box 1' completed drawing).
- * Box 3 stores supplementary data such as section views, bills of materials, vendor information, etc. This material is in 'plottable' form, but is not usually plotted with the main drawing.
- * Box 4 is never plotted : it contains plotting instructions (pen weights and colours, scale factors, etc), drawing history (modifications list, etc), and other 'housekeeping' and administration information.

			
FINISHED DRAWING	BORDER & TITLE BLOCK	OTHER DATA & DRAWINGS	HOUSEKEEPING DATA

A.2. USING THE LIBRARY

ROBO Pre-Drawn Source Disks

These disks, available from your dealer, contain commonly used source material such as standard symbols, typefaces, etc. They should be used in exactly the same way as your own Source disks - namely as a common resource of read-only material.

Do not store any of your own material on a pre-drawn Source disk.

Printing the Index page

You may find it useful to make a print of the material stored on your Library disks, as a convenient reference of their contents. To do this, you must have a printer (with 'graphics dump') installed; refer to Section 1.3. for more information.

Assuming that you have a graphics printer installed, follow this procedure :

- 1 Switch on the printer, set it 'On-line' and load with paper.
- 2 Select UTILS from Menu 1. Select SCREEN IMAGES - CATALOG. A list of all named screen images will be displayed. The first three are 'A' 'B' and 'C', the three Library indexes.
- 3 Return to the UTILS menu and select SCREEN IMAGES - LOAD.
- 4 Enter A B or C as required, then press RETURN.
- 5 Select SCREEN IMAGES - PRINT and follow the prompts.
- 6 When printed, you can repeat steps 3 - 5 for the other two indexes if required.

A.3. FORMATTING LIBRARY DISKS

Choosing the Index Format

You should tailor the Index format to suit your application - Large boxes (4 per Index) for large drawings; Medium sized boxes (16 per Index) for average complexity drawing modules and Small boxes (64 per Index) for simpler symbols, characters, etc.

Library Disks (Compiler and Source)

Before a new unused floppy disk can be used as a library disk, it must first be formatted. To format a library disk, follow this procedure :

- 1 Select Option 2 from the System Menu. A screen is displayed presenting the formatting choices.
- 2 Insert a new disk in Drive 2 and close the drive flap.
- 3 Enter the SET Number (1 to 63) and press RETURN.
- 4 Enter the VOLUME Number (1 to 253) and press RETURN.
- 5 Enter the format for Index A (64, 16 or 4 boxes).
- 6 Repeat (5) for Indexes B and C.
- 7 While formatting takes place, a message is displayed confirming Set and Volume Number.
- 8 When finished, the System Menu is displayed and another Library Disk may be formatted if required.

Remember to label the formatted Library Disk with the Set, Volume and Index format specified.

```

  -----
  FORMAT COMPILER DISK
  -----
  * INSERT DISK IN DRIVE 2

  ENTER SET NUMBER (1-63)  6
  ENTER VOLUME NUMBER (1-253)
  FORMAT INDEX A (64/16/4)
  FORMAT INDEX B (64/16/4)
  FORMAT INDEX C (64/16/4)

  -----
  PRESS <ESC> TO RETURN TO MENU
  ENTER VALUE AND PRESS <RETURN>
  
```

```

  -----
  FORMAT SOURCE DISK
  -----
  * INSERT DISK IN DRIVE 2

  ENTER SET NUMBER (1-63)  6
  ENTER VOLUME NUMBER (1-253)
  FORMAT INDEX A (64/16/4)
  FORMAT INDEX B (64/16/4)
  FORMAT INDEX C (64/16/4)

  -----
  PRESS <ESC> TO RETURN TO MENU
  ENTER VALUE AND PRESS <RETURN>
  
```

A.3. FORMATTING LIBRARY DISKS

Archive Disks

This is similar to Compiler and Source Library formatting. A separate option is given on the System Menu for convenience.

- 1 Select Option 3 from the System Menu. A screen is displayed presenting the formatting choices.
- 2 Insert a new disk in Drive 2 and close the drive flap.
- 3 Enter the SET Number (1 to 63) and press RETURN.
- 4 Enter the format for Index A (16 or 4 boxes).
- 5 Repeat (4) for Indexes B and C.
- 6 While formatting takes place, a message is displayed confirming Set Number.
- 7 When finished, the System Menu is displayed and another Archive disk can be formatted if required.

Remember to label the formatted Archive disk with the Set and Index format specified.

APPENDIX B ERRORS

If an Error or Warning condition occurs during operation of the system, a message will be displayed at the bottom of the screen.

The messages, and the recovery procedures are as follows :

1 COPY TOO LARGE

Cause : In SCALE mode, when attempting to COPY an item, also drawn in SCALE mode, whose relative size is too large for the given Scale Page.

Action : Either re-specify the Page size, or de-select SCALE and COPY under 'free-form' control.

2 DIRECTORY FULL

Cause : Attempting to FILE when the Library Disk's Directory is full (all 200 entries used).

Action : FILE onto another Library Disk.

3 DISK FULL

Cause : Attempting to FILE when the Library Disk's space is exhausted (all 406 available tracks used).

Action : FILE onto another Library Disk.

4 DISK WRITE PROTECTED

Cause : Attempting to write to a disk which is protected with a Write-Protect tag.

Action : Remove the tag and re-try.

5 FILE NOT FOUND

Cause : File name not in DOS or System Directory.

Action : If attempting to LOAD IMAGE, check CATALOG for File's presence.

6 ILLEGAL COPY

Cause : Attempting to COPY from an Archive Disk.

Action : Items can only be Loaded from an Archive Disk.

7 ILLEGAL FILE

Cause : Attempting to FILE a drawing in the Index box which contains a item used in the new drawing.

Action : Select another Index box in which to FILE the drawing.

8 I/O ERROR

Cause : Attempting to access Disk which is uninitialised or when the Drive Door open.

Action : Ensure correct disk present and that the Drive Door is closed.

9 MEMORY FULL

Cause : Memory space for including COPY items in a drawing is exhausted.

Action : If 'New Data' memory still available, complete the drawing without further COPY items.

10 OUT OF MEMORY

Cause : 'New Data' memory exhausted.

Action : FILE the drawing; COPY it back on GRID I at 100% SCL. Continue drawing.

11 WRONG SCALE

Cause : In SCALE mode, attempting to EXCH item drawn at a different Scale to the item being replaced.

Action : Use MOVE to adjust the item's size.

